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# QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXIX. 1 JANUARY, 1933. PART 1.

## Event and Comment.

### St. Lucia Farm School.

BROADCASTING from Radio Station 4QG in the course of the month, the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) gave the following interesting account of activities to date in connection with the establishment of the St. Lucia Farm School:—

A contemplation of present conditions reveals that we are face to face with at least one condition that is inimical to the best interests of the State. This condition is described as unemployment, and parents are naturally anxious to find some suitable employment for their sons. With a lessened industrial demand and the capacity for greater and greater production, it is entirely unlikely that the industries of our State will be able to absorb that growing army of maturing boys. The stimulation of agricultural development must, however, reflect itself in a greater industrial demand, and under these circumstances we naturally turn to the land to provide ways and means to brighten the lot of our citizens. A reconstruction of thought is necessary to enable us to more clearly visualise the possibilities of land settlement. It is true that fortunes beyond the dreams of avarice do not lie within the soil, waiting to be charmed forth by the magic touch of a deft hand, but at least life on the land provides health, robustness, and a more fortunate vision than many city dwellers enjoy. Many representative bodies throughout the State recognise that we must turn to the land for the solution of our ''Unemployed Youth'' problem, and so have initiated movements having in view the employment of boys in rural pursuits. The churches are also co-operating in a State-wide scheme for the placing of youths on farms.

These schemes fall generally into two classes. The first provides for the absorption of lads *without previous training*. In the past, this method has been successful, but there has always been a steady demand for boys capable of milking, driving, and ploughing, and attending to the hundred and one duties associated with farm routine. A recognition of this demand has led to the establishment of the St. Lucia Farm School.

It will be remembered that Dr. Mayne and his sister, Miss Mayne, presented to the University a large block of land on the river opposite the South Brisbane Cemetery, and recently the Senate of the University made this land available for the purpose of the establishment of a farm school for boys. At present the holding is undergoing preparation for the new school which, it is confidently anticipated, will provide a sound elementary training for some of our boys at least.

Housing accommodation is being provided for twenty-five boys, and in all fifty boys will be in residence over a period of six months. Each boy will be required to do his turn as a resident student, and the usual surroundings of farm life will be maintained. There is no intention of making excursions into the higher flights of agricultural endeavour, but the rudiments of farm work will be thoroughly taught. A small herd of cows will be milked, the milk separated, and in the winter the processes of butter-making will be demonstrated. In addition, instruction in milk and cream testing will be provided. As dairying is such an important primary industry, special attention will be given to all its branches, and as an adjunct to our dairy a few choice pigs will be maintained. Poultry will be the third arm of animal husbandry. Boys will be taught to handle horses, and to engage in the production of crops and the conservation of fodder. No farm can be complete without these activities, and no farmer is properly equipped without a knowledge of these practices. It will be the aim of the Principal of the school to inculcate the sturdy maxim of "Do it yourself."

The whole of the operations of the farm will be open to the students, and the boys will be taught to cook in anticipation of that time which comes to each farmer sooner or later—that is, when he is thrown absolutely on his own resources. But all work and no play is a bad motto, so the Principal informs me that he intends to make each day one full of interest, and necessarily sport must play its part also. In addition, officers from my Department will visit the school frequently and deliver lectures on rudimentary agricultural subjects.

Each of these visiting lecturers will be a specialist, with vast stores of knowledge which he will be anxious to impart. So our Chief Dairy Expert, the Director of Agriculture, officers of the Animal Health Station, and the Chief Poultry Expert will arrange courses of lectures in accordance with the syllabus decided upon.

A comprehensive curriculum has been prepared, combining theory and practice. The elementary principles of the science and practice of agriculture will be demonstrated in a way that will be readily assimulated.

The possibilities of the farm are excellent. There is a surprisingly wide range of soil types, some of which are especially adapted for certain crops, and the grazing area is suitable for the purpose for which it is intended. The Principal who has been selected has been associated with agricultural education for a number of years, and the balance of the staff are all men specially qualified for the job.

St. Lucia is to be neither an institution within the accepted sense of the term, nor yet an agricultural college. It is to impart instruction in the A.B.C. of agriculture. After six months' instruction, it may be reasonably assumed that our students will have learned to be useful boys on farms. There can be no doubt about the capacity of the Department to train the boys, but side by side runs the great question of employment.

It is significant that various influential organisations, not only throughout the State, but throughout the Commonwealth, are interesting themselves in the vital questions associated with land settlement for youths, and there is a tremendous volume of feeling at the present time that in this direction lies social security. In order to find the necessary employment for the lads after they have completed their training at St. Lucia, the various organisations who have actively associated themselves with the question of employment of boys have been asked to co-operate with this Department.

A committee representative of all these interests has been appointed. Three sub-committees, known respectively as the Recruiting Committee, the Training Committee, and the Employment Committee are in existence.

The New Settlers' League, the Rotary Club, and the Legacy Club are intimately associating themselves with this work. In addition, it is proposed to utilise the various State officers situated in different parts of the State for the purpose of finding employers for the boys.

It is not our intention to place the boys on farms where no adequate supervision or training will be forthcoming. Our desire must necessarily be to place them with the practical progressive farmer. It is not maintained, of course, that a boy will be a completed agriculturist after six months' instruction at St. Lucia, but at least it is felt that the rudiments of agricultural practice will be satisfactorily absorbed.

From time to time we discuss the question of an agricultural bias and recognise the necessity, in present economic circumstances, of directing our thoughts and our attention to the land as one solution of our pressing problems.

In this direction, St. Lucia will be of very definite value. It frequently happens that boys, believing they have a bent along agricultural lines, seek farm employment, only to discover that their new surroundings are not conducive to their happiness or contentment. With St. Lucia we will be able to discover just where a boy stands in this regard, and those boys who show no aptitude or inclination for agriculture will be able to recognise this disability without heart-burning and unhappiness. Parents, too, will have their boys under their observation, and this should prove an attraction to them, for the boys will not be alienated from beneficial home influence.

Already the number of applicants exceeds the number of vacancies, and parents generally seem to be impressed with the possibilities of St. Lucia. In addition to ordinary agricultural training, that indefinable but necessary thing generally known as "bush craft" will be taught.

We have, owing once again to the generosity of Dr. Mayne and the Senate of the Queensland University, a considerable area of bush land at Moggill within easy reach of the St. Lucia farm. Here it is proposed to train squads of boys in timber-getting, clearing, and all the activities associated with bringing land under the plough. In conclusion, I would make an earnest appeal to the farming community to assist our city boys to a life of health, freedom, and comparative economic independence.

## Rhodes Grass—Tested Seed for Sale.

IT is desired to call attention to the announcement in another section of the Journal that the Department of Agriculture and Stock has available for distribution tested Rhodes grass seed, at 1s. 11d. per lb., or 1s. 9d. per lb. for lots in excess of a hundredweight. Application, accompanied by remittance to cover cost, should be made to the Under Secretary. Exchange should, of course, be added to country cheques.

# The Minister's New Year Message.

To the

## FARMERS OF QUEENSLAND

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Department of Agriculture and Stock,
Brisbane, 31st December, 1932.

THE dawning year will bring with it many difficulties, hardships and disappointments. These, however, can certainly be minimised by conscious united effort. We are people of a Commonwealth, with high ideals and lofty ambitions, to which all sections of the community subscribe.

Now is the testing time of nationhood. In the past we have contributed much to the advancement of national ideals, but much more remains to be done.

In the field of primary production, we are suffering from the effects of diminished purchasing power among the peoples of the old world, leading as it must to under consumption. Industry is efficiently organised but primary production is far less efficient in organisation.

Difficulties are overcome by that expression of conscious effort—"organisation"—and my sincere hope is that the new year will mark a definite advance along the road of primary production in our State.

We of the Department of Agriculture and Stock sincerely hope that happiness, health and prosperity will be the lot of our farming community during the year 1933.

Frank. W. Bulcock

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

### THE GREYBACK CANE BEETLE.

By EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature colculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

1. Completion of the flighting and egg-laying periods of our principal cane beetle, *Lepidoderma albohirtum* Waterh.
2. Greyback grubs of the first instar (Stage 1) reach their maximum development.
3. Consult table below, giving correct date for commencing fumigation of grub-infested cane lands.

THE first two or three weeks in January offer special interest and attractions to lovers of Nature Study; the winged or aerial existence of our notorious cane beetle being now everywhere in evidence. In the day time, these grey uncanny-looking large cockchafers can often be seen clustering thickly on bushes by the roadside; while the branches of many big feeding-trees around the paddock or homestead are literally bending beneath the accumulated weight of tens of thousands of beetles clinging to twigs and leaves. Such abundant evidence of insect life, although admittedly more or less spectacular, too often foreshadows possible injury to cane crops in the near future, suggesting, perhaps, in some cases partial failure, or in others impending disaster.

#### Chief Food Plants of the Greyback Cockchafer.

The favourite feeding-trees of this insect are:—"Weeping Fig," mango, and "Moreton Bay Ash," but the foliage of several other trees and shrubs is also devoured by them with avidity.

#### Termination of the Egg-laying Period.

The commencement and mode of oviposition of the greyback was described last month in the "Queensland Agricultural Journal," and would naturally apply also to beetles chancing to emerge from the ground at the end of December, which would oviposit about the middle of January. During the present month, however, eggs of this pest are generally more plentiful than at any other time of year, and may now be found in the soil at depths of 12 to 15 in. or more in all stages of development, from $\frac{1}{8}$ to nearly $\frac{1}{4}$ in. in diameter.


PLATE 1.

Habits of the "Greyback" Cockchafer Beetle and its young Grubs during the month of January.

### A Single Emergence of Beetles Expected.

Owing to a spell of dry weather experienced throughout September to November, during which period only 115 points of rain fell at Meringa instead of 7.51 inches (which is the average for these three months), there has been no early appearance of greybacks this season. At present it looks as though a single primary emergence may take place about the second or third week in December; in which case, no additional brood should occur during January.

### Greyback Cane Grubs Found During this Month.

In years when these cockchafers chance to appear on the wing in November, one can find larvæ in both first and second stages of growth during the month of January. In such seasons those of the first stage may occur in various sizes from $\frac{1}{4}$ to $\frac{3}{4}$ in. long; the head, however, invariably being $\frac{1}{8}$ in. wide, and remaining so during the whole time occupied in development of the first instar.

Should the head be found to measure exactly a $\frac{1}{4}$ in. in width, one can be certain that such grubs have moulted (changed their skin) and commenced the second stage of growth, during which period of about thirty-eight days the body attains a length of $1\frac{1}{2}$ in., although the head (let it be remembered) does not increase in size.

However, November has passed by without liberating the expectant host of greyback beetles confined in their subterranean pupal cells; so that growers in the Cairns district are not likely to encounter many second-stage grubs of this pest during January.

PLATE 2.

Fig leaves (*Ficus pilosa*) being eaten by the greybacks, together with a picture of the beetle slightly reduced.

The table given below should, nevertheless, be helpful to those intending to fumigate their grub-infested cane land, as in the event of an emergence of beetles taking place about the end of December or beginning of January, reference to this table will show the correct date on which to start fumigating the cane in February, together with the length of time available for making preparations for this important work:—

WHEN TO FUMIGATE GRUB-INFESTED CANE LAND.

| Beetles emerge. | Time to Fumigate. | Beetles emerge. | Time to Fumigate. | Beetles emerge. | Time to Fumigate. |
|---|---|---|---|---|---|
| December 5 | February 13 | December 14 | February 22 | December 23 | March 3 |
| ,, 6 | ,, 14 | ,, 15 | ,, 23 | ,, 24 | ,, 4 |
| ,, 7 | ,, 15 | ,, 16 | ,, 24 | ,, 25 | ,, 5 |
| ,, 8 | ,, 16 | ,, 17 | 25 | ,, 26 | ,, 6 |
| ,, 9 | ,, 17 | ,, 18 | ,, 26 | ,, 27 | ,, 7 |
| ,, 10 | ,, 18 | ,, 19 | ,, 27 | ,, 28 | ,, 8 |
| ,, 11 | ,, 19 | ,, 20 | ,, 28 | ,, 29 | ,, 9 |
| ,, 12 | ,, 20 | ,, 21 | March 1 | ,, 30 | ,, 10 |
| ,, 13 | ,, 21 | ,, 22 | ,, 2 | ,, 31 | ,, 11 |

Remember that the above dates refer to districts in which only one emergence has taken place. In those receiving sufficient rain to bring about a primary emergence of beetles during November, followed by a secondary brood a few weeks later, the period given in the table—from emergence of beetles to time to fumigate—should be extended in such cases to about 100 days, in order to make sure of killing the grubs from both emergences.

### How to Destroy the Greyback Beetle, Its Eggs, and First Stage Grubs.

In seasons when grey-backs fail to appear until late December, the recommendations offered last month with regard to means of destroying them would apply also to January. Long continued dry weather will sometimes cause very heavy mortality among these beetles, and when operating over immense areas of forest land exercises an ideal natural remedy. Collecting the beetles is perhaps the best-known commonsense control method; having yielded beneficial results both in Australia and other countries. This is usually practised during seasons when the pest chances to be very plentiful; although it seems reasonable to assume that remedies of this kind might give us best results during years when such natural checks happen to have thinned the enemy's ranks, since any additional destruction of the survivors should tend to act as a kind of knockout blow, by prolonging the period which must necessarily elapse before the succeeding broods of this cockchafer could once more finally regain normal numerical force. In view of possible late emergence of these beetles, the following additional methods of fighting them should again be mentioned:—

1. Destruction of their food plants.
2. The use of soil deterrents against oviposition.
3. Poisoning the foliage of feeding-trees.
4. Rigorous protection of our insectivorous birds.

The economic value of numbers 2, 3, and 4 could with advantage be more fully investigated in the near future.

### Destroying Eggs of the Greyback.

Experiments conducted by the present writer in November of 1921 secured conclusive proof that these eggs could be killed in a few hours of fumigating the soil above them with carbon bisulphide. Commonsense control measures against the eggs and newly-hatched grubs may also, to some extent, be affected by certain cultural operations. For instance, by keeping a strip of ground about 15 in. wide on each side of a cane row loosened up and free from weeds at commencement of the flighting season, and maintaining such state of friability about four to five weeks, one can take advantage of a habit common to many scarabæid beetles of ovipositing by preference in unbroken ground; the firm condition of which, by affording a suitable fulcrum, enables these insects to easily retain the correct position assumed when excavating their subterranean tunnels.

Such movement of the upper soil during a period of five to six weeks (commencing about a month after the first emergence of beetles) will often destroy a certain percentage of grubs of the first stage, which occur at times comparatively near the surface; by breaking up their feeding-tunnels, thus exposing them to attacks from various foraging ants.

Endeavour, if possible, to have the soil between cane rows well worked and free from weeds before greybacks appear on the wing, and throughout the flighting and egg-laying periods. A luxuriant growth of weeds, &c., amongst the stools is strongly attractive to egg-laden females of the greyback cane beetle.

At this time of the year when eggs and small grubs of the pest are much in evidence, it is advisable, so far as possible, to keep the surface soil in good "heart," as near to the stools as can be conveniently effected without risking material injury to the cane plants.

The plate for January somewhat resembles that published last month. Greyback beetles are still in the feeding-trees, or ovipositing in the ground, while eggs are hatching, and grubs of the first-stage feeding on cane roots near the surface are preparing to moult into the second stage of development.

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## THE RIGHT SPIRIT.

Fetlar is a small island in the Shetlands, with a population of only 200, but there were no fewer than 600 entries in all sections at its annual agricultural show. Some of the best cattle in the islands are reared in Fetlar. It has a high reputation also for sheep and ponies.

# Factors Governing the Value of Different Forms of Lime.

By H. W. KERR and C. R. VON STIEGLITZ.

EARLY records show that the value of lime as a soil improver was known to agriculturists over 800 years ago, and its use has persisted as a standard practice through the intervening centuries. It is only quite recently, however, that its true functions have been clearly understood. Lime is, strictly speaking, an essential plantfood, and in its complete absence the soil is quite sterile. The relative needs of various plant species for this nutrient vary widely, however. Lucerne and many other legumes appear to thrive only in soils abundantly provided with this plantfood. Sugar-cane, on the other hand, is not a lime-loving plant, and the employment of lime on the cane soils of the State must be traced to its virtues in other important respects.

These may be listed briefly as follows:—

(1) Neutralisation of harmful soil acids;

(2) Provision of an environment more favourable to the helpful soil bacteria;

(3) Rendering plantfoods in the soil more readily available to the crop;

(4) Enabling fertilizers to exert their full influence on cane yields;

(5) By continued use on clays and clay loams, tending to improve their physical state and favouring the production and maintenance of good tilth.

Under our conditions, lime is employed primarily for its influence on soil acidity. In regions of high rainfall continued leaching results in the rapid removal of lime, and often induces an acid condition in the soil; in extreme cases the soil becomes so intensively acid that crop growth is completely suspended. Such lands actually exist in localised areas in North Queensland. It is the destruction of the poisonous acids by liming which promotes also increased activity among the soil microbes—those tiny inhabitants of the soil, which feed on the soil organic matter and yield valuable plantfoods as the by-product of their life processes. Certain of these little workers also, which normally effect the necessary conversion of fertilizer to a form in which it is absorbed by the crop roots, are unable to function under intensively acid conditions. Further, results are on record which show that sulphate of ammonia may actually reduce crop yields on soils of this nature. Following an application of lime, the same soils gave pronounced results from the use of this valuable fertilizer.

A confusion of terms appears to have arisen out of the use of the words "sour" and "acid" to describe the condition of certain soils. The farmer frequently applies lime to heavy, wet, ill-drained lands which he describes as "sour." The use of this material frequently facilitates the drying out and "sweetening" of the soil, as the farmer expresses it. It should be clearly understood, however, that the "acid" soils so far discussed comprise many of our best-drained lands such as the alluvial loams of the Innisfail and Babinda areas. The function

of the lime on these lands is essentially to neutralise the soil acids; and though the heavier soils of this type are markedly improved in tilth following the use of lime, this is rather incidental.

## KINDS OF LIME.

When a grower proposes purchasing lime, he is frequently perplexed by the range and variety of materials from which he may make his choice. A brief description of the important forms of lime may clarify the position, and indicate the several factors to be considered.

Lime occurs naturally in the form of deposits which vary considerably in their physical state. All have, however, the same chemical composition—*carbonate of lime,* or agricultural lime as it is popularly known in its marketed form. Marble, limestone, coral lime, and earth lime (or marl) all contain this compound as their active ingredient, though they may show a wide range of incidental inpurities in the form of clay or earthy matter which reduce their monetary value. Coral and marble are usually very pure forms of lime, while earth lime frequently contains as little as 40 per cent. of this constituent. On the other hand, certain earth lime deposits which are exploited in Queensland show as high as 95 per cent. of lime carbonate.

Another form of lime which is frequently employed is known as *burnt lime.* This form does not exist naturally, but as the name indicates it is manufactured from carbonate of lime by the process of burning. If we should burn 100 lb. of pure limestone or marble, we would obtain 56 lb. of burnt lime. The proportion which is lost (44 lb.) consists of carbonic acid gas or carbon dioxide, which passes into the atmosphere. Burning therefore results in a concentration of the active material, none of which is lost in the process. If a compact lump of burnt lime should be exposed to the air, it will be found that it slowly increases in size, and gradually crumbles to a very fine white powder. The action of the atmosphere in this respect is simply a reversion of the burning process, and the "air-slaking" as it is called results in the re-absorption of 44 lb. of atmospheric carbon dioxide by every 56 lb. of burnt lime, to give once again 100 lb. of carbonate of lime.

Now it is a well-known fact that the different forms of lime exhibit pronounced differences with respect to the speed with which they effect their beneficial influence on the soil. Burnt lime is consistently superior in this regard; and though the caustic action of the fresh material is often considered a serious objection, this effect may be largely minimised by air-slaking prior to spreading. It may appear somewhat difficult for the farmer to understand why the carbonate of lime which is again produced by slaking is so definitely superior to other forms of carbonate of lime. The explanation lies in the fact that the speed of action depends entirely on the fineness of the product. Lime does not readily dissolve in the soil moisture, as do soluble mineral fertilizers, and the rate at which it reacts with the solid acid substances in the soil depends on the degree of intimacy with which the lime and soil particles can be brought together. If the grower expects quick results from liming, the necessity for having the lime finely powdered will be readily appreciated. Air-slaking of burnt lime actually effects this desired condition most effectively, but the practical difficulties associated with the mechanical disintegration of limestone generally result in a marketed product which, though apparently well pulverised, still contains particles which are exceedingly coarse when compared with the particles of air-slaked lime.

### EXPERIMENTAL.

This consideration is of the greatest importance in the evaluation of a sample of agricultural lime; and to provide a clearer picture of the influence of fineness of grinding on the speed of neutralisation of soil acids, an interesting series of tests was carried out in our laboratory.

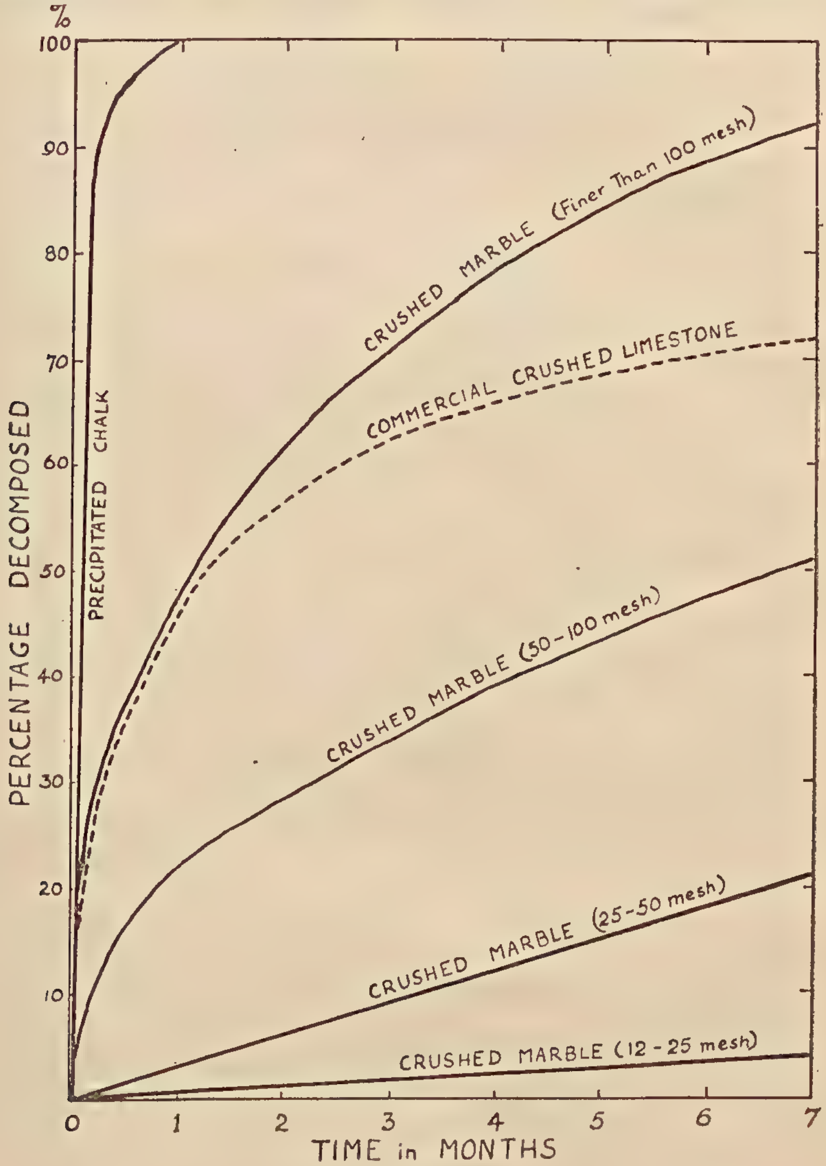


PLATE 3.—Fig. 1.

The graph shows that the finely-divided precipitated chalk had completed its work within a month of mixing. The high-grade commercial lime showed only about 70 per cent. decomposition after seven months, while the material of particle size 1/12-1/25 inch diameter was practically worthless.

A number of liming materials of varying particle size was selected as follows:—

(1) Precipitated chalk—an extremely finely divided form of carbonate of lime, comparable with air-slaked lime.

(2) Pulverised marble—particles fine enough to pass a sieve with 100 meshes to the inch.

(3) Pulverised marble—particles passing a 50-mesh sieve, but coarser than 100 mesh.

(4) Pulverised marble—particles passing a 25-mesh sieve, but coarser than 50 mesh.

(5) Pulverised marble—particles passing a 12-inch sieve, but coarser than 25 mesh.

(6) A sample of commercial crushed limestone, regarded as high grade; 90 per cent. was fine enough to pass a 50-mesh sieve, and the sample contained a large proportion of very fine particles.

As a suitable soil for the purpose a highly acid alluvial clay loam from our South Johnstone Station was selected. Six equal samples were weighed out and submitted to an application of lime at the rate of 6 tons per acre, employing each of the above grades of material.* The soil and lime were mixed thoroughly, and water added to bring the mass to a condition of optimum moisture. The samples were then covered, set aside in the laboratory and stirred from time to time to enable the material to react. Portions of the soil were withdrawn at regular intervals, and the amount of carbonate of lime remaining unchanged was determined. In all, the process was continued over a period of seven months.

The accompanying graph brings out very clearly the relative values of the lime, as governed by particle size; and the results demonstrate in no uncertain manner that if the influence of liming is to be felt within a reasonable period, a large proportion of the material used should be fine enough to pass through a 100-mesh sieve. The sample of high-grade crushed limestone which was included in the tests was found to react quite rapidly, and 50 per cent. of the material had done its work within a month of mixing. This undoubtedly constituted the finest particles, and the coarser material then reacted with the soil acids at a markedly reduced rate.

The fact that "coral sand"—undoubtedly a very pure form of lime—produces so frequently a very disappointing result when applied at, say, 2 tons per acre, is due entirely to the fact that it is usually marketed in a condition which is far too coarse to ensure a reasonable speed of action. In other words, the coarse material gives the farmer his money's worth in lime, but not in added cane yield; and the unchanged grains of lime may remain practically inert in the soil for many years.

## CONCLUSION.

We may now summarise the conclusions to be drawn from the preceding remarks and experimental results. In choosing a suitable liming material, the following facts must be considered:—

(1) Burnt lime, even after air-slaking, will give most rapid results, due to the completeness with which it may be mixed with the soil particles.

* Though this may seem an excessive dressing, it was barely sufficient to neutralise all the acids in this particular soil.

(2) One ton of pure burnt lime is equal in lime value to 1¾ tons of pure agricultural lime; this is an important point, where freights and haulage charges constitute an appreciable proportion of the cost of lime *on the farm.*

(3) Other things being equal, the finer the condition of the agricultural lime, the quicker will favourable results be obtained. Particles coarser than one-twentieth of an inch in diameter are practically worthless, and in a country where lime costs are so high, the farmer should pay particular attention to this consideration.

In general, an initial application of burnt lime is to be recommended for highly acid soils. Where growers are able to obtain good quality agricultural lime at a reasonable price, the use of this material is recommended, as a subsequent practice, to maintain the soil in an acid-free condition. On many soils of the humid northern areas, it has been found that an application of 2 tons of agricultural lime may be employed profitably each time the land is replanted. Under these conditions, the lime should be spread broadcast following the final ploughing, and lightly harrowed into the land.

We would again point out that it is our pleasure to assist canegrowers in determining the need for lime, due to excessive acidity in their soils. Samples should be forwarded to the Director, Bureau of Sugar Experiment Stations, Brisbane; or where growers are situated in closer proximity to our South Johnstone Station, samples should be consigned to that address. A covering letter should express the desire for an opinion on the lime requirement of the particular soil.

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## CREAM FREIGHTS.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) has called attention to a certain amount of misapprehension on the part of cream suppliers in the application of the amendment of the Dairy Produce Act with regard to the payment of cream freights. He points out that it was not intended that the supplier must prepay the freight. He may send his cream to the factory in the usual way, and the amount due for freight would be deducted from the cream cheque at the end of the month and paid by the factory to the Railway Department.

The Minister states that the amendment was framed so that each supplier will be responsible for the amount of freight on his own particular supply of cream, and it will be necessary to indicate the cost of sending this cream to the factory on the statement he receives from that factory with his cheque. Mr. Bulcock also pointed out that it was necessary for the factory to show the individual debits made against suppliers when making payment to the railway for cream carried.

There is no restriction or prohibition on cream suppliers sending cream to any factory in Queensland, and they may continue to send cream to the factory they at present supply. The only factor taken into consideration, said the Minister, is the payment of the freight which must be borne by the individual supplier.

# Intensive Cane Production.

By H. W. KERR and E. J. R. BARKE.

AS a means of reducing production costs of agricultural crops, the importance of intensive cultivation under our Queensland conditions has been repeatedly stressed. Before this can be effected, it is essential for the farmer to have a clear understanding of the chief factors influencing crop yields. For sugar-cane, the following are the more important:—

(1) A continuous supply of soil moisture in a well-drained soil;

(2) An adequate supply of available plant food;

(3) High temperatures combined with a humid atmosphere;

(4) Absence of harmful substances in the soil, such as intensive acidity;

(5) Freedom from the influence of diseases and pests.

In our several cane districts these various factors enter in greater or lesser degree to influence crop production. In the central and southern areas it is generally conceded that soil moisture deficiencies are the most serious causes of reduced yields, while in the humid north plant food deficiency is usually blamed for crop limitations. It is well to investigate these questions more closely, however, and learn by actual experiment the relative importance of these factors both individually and collectively.

During the past few years we have carried out extensive observations on the relationship between climatic factors and crop growth. Selected cane stalks growing in the field under observation are subjected to systematic periodical measurement, and from the records obtained it is possible to trace clearly the manner in which the crop has grown. Fig. 1 illustrates a growth rate curve constructed from data secured at our South Johnstone Station in 1929-1930. It will probably come as a surprise to most growers to find that even in this region of heavy rainfall the distribution is far from ideal; the cane does not make even growth, and the production rate is greatly influenced by the incidence of rainfall. The maximum growth rate is sustained for only a brief period following rain, and during rainless spells it falls to a small fraction of the maximum.

Repeated fertilizer experiments on this Station show very clearly that the soils of the heavy rainfall belt are highly leached, deficient in available plant foods, and often in need of liming to neutralise acidity. Heavy applications of lime or additions of appropriate mixed fertilizer up to one-half ton per acre result in very definite increases in crop yield, and these results prompt the question—What would be the maximum cane yield were we to remove all controllable factors limiting cane growth? Given an adequate supply of moisture and plant food at all times, how many tons of cane per acre could be produced under natural conditions of temperature and atmospheric humidity?

## Experimental.

By the nature of the problem and the difficulties involved in fulfilling the prescribed requirements, the experiment had necessarily to

be performed on a small scale. Actually a single row 25 feet in length was employed. The soil was excavated to give a trench 3 feet wide and 3 feet deep. Soil and subsoil were carefully separated. As the land was strongly acid the soil was limed liberally, and also treated to a heavy application of stable manure and mixed fertilizer before being replaced in the trench. The cane was planted in this excellent seed-bed in April, 1931. In order to ensure that the plant food and moisture supply to the crop should not limit cane production, the following treatments were made throughout the growing period of the crop:—

*Fertilizer.*—Every month the cane received a dressing at the following rate per acre:—

100 lb. sulphate of ammonia.
50 lb. superphosphate.
20 lb. muriate of potash.

*Irrigation water* was applied as follows:—

Winter—Two inches per acre per week.
Spring—Four inches per acre per week.
Summer—Six inches per acre per week.

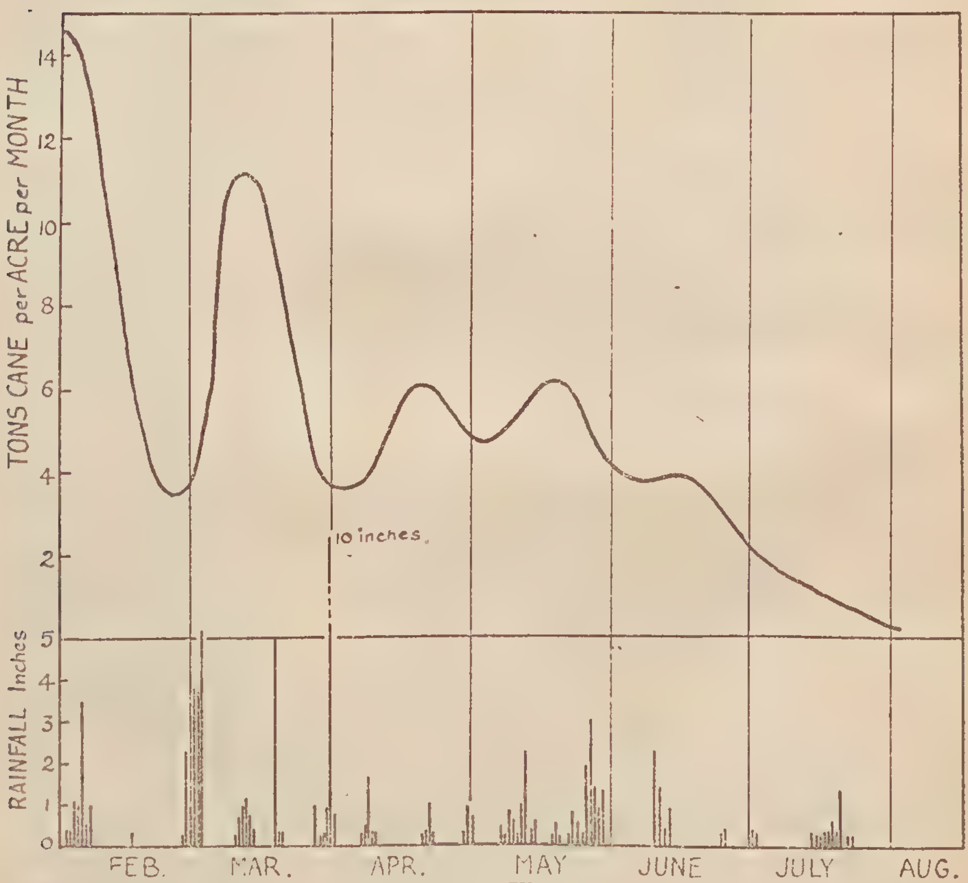


PLATE 4.—Fig. 1.

Showing the erratic nature of crop production under natural rainfall conditions at South Johnstone. The fluctuations in the growth curve lead to considerable reductions in crop yield.

Twenty-five secondary shoots were selected in July, and growth measurements on these were made at regular three-day intervals until the crop was harvested. It was thus possible to trace the course of crop production and, finally, to determine the relative proportions of the crop produced during individual growing months.

For purposes of comparison, a second trench was prepared in a manner entirely similar to the above, but the planting of this line was deferred until August, 1931. Under the conditions of the experiment it was thus possible to gauge the relative influence of time of planting on crop production.

In August, 1932, the crops were harvested. Each had made exceptionally good growth, particularly that planted in April; the stools were very heavy, and the average length of stick in the early plant Badila was over 11 feet. From the cane yields the following tonnages were calculated, assuming a field of similar cane with rows at 5-feet interspaces:—

| Planted. | Harvested. | Age of Crop. | Tons of Cane per Acre. | C.C.S. % | Tons C.C.S. per Acre. |
|---|---|---|---|---|---|
| 1931. | 1932. | Months. | | | |
| April | August | 16 | 143·9 | 15·9 | 22·9 |
| August | August | 12 | 58·3 | 15·8 | 9·2 |

Now it is not suggested for one moment that under field conditions the enormous crop of 144 tons of cane per acre could be produced; the above conditions were as nearly as possible ideal, and with the single row border effects were eliminated. Nor could a c.c.s. value of 15·9 per cent. be realised where under natural conditions such a crop would be a tangled mass of lodged cane with low sugar content. But there are valuable lessons to be learned by studying the various factors instrumental in the production of this heavy crop which could profitably be considered in conjunction with normal farm practice. It is proposed to study these influences and discuss their applicability.

As a basis for discussion the growth rate has been reproduced graphically in Fig. 2. The solid blocks represent by their area the tons of cane produced in each calendar month; the small numbers in the circle indicate the actual monthly tonnages. Curves representing variations in the relative periods of daylight and mean atmospheric temperatures are included also.

## Time of Planting.

Under the conditions of our experiment we sought to remove the limiting factors—moisture and plant food supply—from the consideration. Any variations in crop growth rate should then be dependent chiefly on (1) air temperature and (2) hours of daylight. Fig. 2 shows very definitely that this is the case. The maximum growth rate was attained when the days were longest and the temperatures the highest—that is, in the month of December. This fact is one of very great importance in its relationship to normal farm practice. Where the cane was planted in April it utilised the cooler months of the winter in

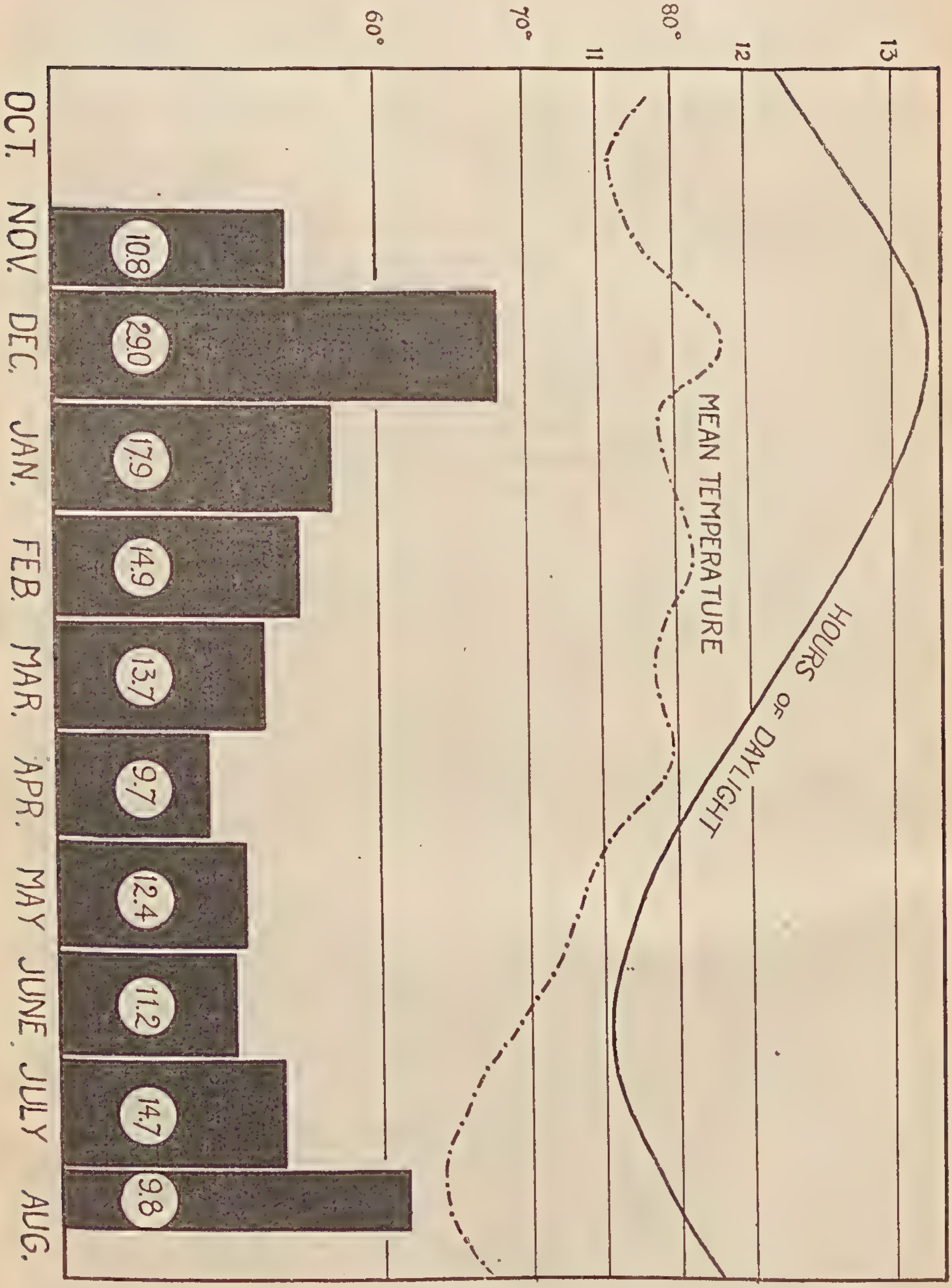


PLATE 5.—Fig. 2.

The solid blocks represent the tons of cane per acre produced under optimum conditions during each calendar month. The curves for hours of daylight and mean temperature fit very well with the growth rate, and show the particularly favourable growth conditions of December, provided that moisture and plant food are available.

becoming established and producing a heavy stool of vigorous shoots. Temperatures during this period were quite adequate for the purpose, and with the advent of the warmer spring months the growth rate speeded up, so that by early November millable cane was showing. During December this crop put on cane to the extent of 29 tons per acre, and from this maximum value the growth rate declined through the cooler and shorter days of late summer and autumn, but even in the coldest month (June) the rate was still about 10 tons per acre per month under the favourable growing conditions provided.

Contrast these figures with those from the spring planted crop. The highly favourable days for cane production of November and December were utilised in enabling the crop to become established, and millable cane was not in evidence until the latter part of January. This is a period when growing conditions, though still quite favourable, are on the decline. It should be pointed out that the discrepancy in crop yields between the autumn and spring planted cane was not entirely due directly to the time of planting. The spring planted cane was severely damaged by top-rot disease which seriously checked its growth and undoubtedly resulted in a marked reduction in crop yield. It is very significant that the autumn planted cane was quite free from the disease, though growing in close proximity to diseased cane. This provides a vivid example of the influence of planting time on the incidence of top-rot, and supports the recommendations of our pathologists that in areas subject to this disease early planting should be practised whenever possible. Assuming that the crop had been disease-free, and taking the growth rate of the autumn plant, the crop would still be inferior to the latter to the extent of 50 tons per acre.

### Plant Food Supply.

Although no direct evidence was obtained from this experiment to indicate the influence of the added fertilizer on the growth of the crop, this was undoubtedly most important. During its growing period the early planted cane received about 2,700 lb. per acre of mixed fertilizer in the monthly applications, over and above that applied to the seed-bed. Excessive though this may appear, it was not capable of supplying the full plant food requirements of the 144-ton crop. It has been calculated that the plant food removed by 1 ton of cane is equal to that contained in 25 lb. of mixed fertilizer, and on this basis the above crop would require 3,600 lb. per acre. These facts emphasise the absolute necessity for the consistent application of heavy dressings of fertilizer if the farmer would harvest heavy tonnages of cane per acre while maintaining his soil in a highly productive state. This is particularly true of soils in the districts of heavy rainfall where the soil in its natural state has been robbed of its plant food reserves by the leaching action of the excessive rains over many centuries.

### Irrigation.

Finally, we have to consider the influence of an adequate moisture supply in a well-aerated soil. The importance of this factor cannot be over-emphasised. The accompanying illustration (Fig. 2) shows that, even with low winter temperatures, cane can maintain an appreciable growth rate provided that moisture is available to it at all times. It is unfortunately true that September, October, and November are the

driest months of the year, and at this time the crop often suffers severely from lack of soil moisture even in the humid North. The severe check which the crop receives at this time seriously retards its development and prevents it from taking full advantage of the favourable cane-producing conditions usually associated with the long, hot, and rainy days of December. The average wet season rains are also relatively poorly distributed, as is demonstrated by the growth rate curve of Fig. 1.

The obvious remedy for this defect is the exploitation of irrigation possibilities to their fullest extent. To growers in the central and southern areas this cannot be too strongly advocated; while growers in the far north, who are so frequently situated in close proximity to permanent streams of the highest quality water, could in many cases double their crop yields by judicious irrigation. It will be argued that irrigation adds to farming costs; the important question is, however, will it reduce the cost of production per ton of cane? If so, then it is in the grower's best interests to adopt the practice. It may also be suggested that the added tonnage will still further embarass an already depressed sugar market. This is, of course, entirely the grower's affair. The maximum area of land which he is permitted to bring under cultivation is limited by his assignment, but the lower limit is subject to his discretion. If he chooses to produce his present tonnage from one-half of the area now harvested, and in so doing he reduces his costs of production, then the principle is highly sound and economical.

At the present time the Burdekin district is the only one where irrigation is practised consistently. The results which are obtained there should afford strong evidence of its importance on crop growth. During recent years this area has made marked progress in the development of more efficient water application methods, and the better farmers of the district have repeatedly produced 50 and 60 ton crops. Certainly this area possesses some of the richest cane soils in Queensland, but there are others which are relatively difficult to work and in need of artificial manures. In other respects also conditions are not ideal. The land surface is practically level throughout the district, and the slight irregularities in the topography are just sufficient to make it more difficult to provide an even distribution of water. The favourable gentle slopes of other districts would make the process of irrigation simple by comparison. For a great proportion of the year, also, the area is subjected to the unfavourable influence of hot, drying winds, which rapidly remove soil moisture by evaporation and distress the crop. The latter does not flourish under these conditions, and much energy is expended in an attempt to sustain the unusually rapid evaporation loss from its leaves. These difficulties are cited to demonstrate the fact that other cane areas, both to the north and south, are much more favourably situated with respect to many conditions which would make for heavy crop yields, given an abundance of soil moisture. The Bundaberg district in particular is one which would again occupy a very prominent place in our sugar world, and it is pleasing to note that irrigation on an intensive scale is being practised at Bingera plantation this season. There can be no doubt as to the results which will follow. When it is remembered that the summer days are longer in the southern areas than in those districts lying nearer the equator, and air temperatures are equally favourable during this season, the production of a 50-ton crop requires but a few months of favourable growing conditions, and fertilizer and irrigation water will do the rest. The taller crops will be

subjected to less damage from frosts in the winter, while a moist soil is characteristically a better conductor of heat than a dry one, so that the severity of frosts is again minimised by watering. The red volcanic soils of the Bundaberg area are probably the most suitable lands for irrigation that could be found, being almost identical with the better class irrigated areas of the Hawaiian Islands, which are famed for their productivity.

There is another aspect of irrigation which should appeal to growers in those areas where cane grubs are active. A continuous supply of soil moisture will provide conditions best suited to the rapid replacement of roots as they are chewed off by this pest, and though the severe check in growth will not be eliminated the crop will be saved. This suggestion is worthy of serious consideration by growers in the Gordonvale area, for example, where an abundant supply of water from the Mulgrave River could be diverted for the purpose.

This whole question is one which should not be turned aside lightly by any grower fortunately situated with respect to water supply. In times of economic stress it is easy for the primary producer to fall into unsound practices in an attempt to reduce costs. One most frequently employed is a reduction in the purchase of fertilizer—the material so essential to the maintenance of the plant food supply of soil and crop. Under this policy the assets of the farm are rapidly dissipated, and its effects are only too clearly illustrated by the unfortunate circumstances which surround certain of the older cane-producing areas. Their pioneering days came at a time when the value of artificial manures was not appreciated, so that to-day the land has been reduced to such a low level of fertility that in many instances cane production under natural climatic conditions is economically impossible. It should be evident to every grower that to farm a smaller area intensively, and give the remainder of the land a prolonged rest under grass, is the surest method of maintaining a fertile soil. This policy enables Nature to continue with her process of building up plant food reserves in the soil—a process which was rudely interrupted when the soil was devoted to continuous cane cultivation.

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## PEANUTS AND PIGS.

### A Warning to Farmers.

Much trouble is being experienced by bacon factories through receiving pigs which produce soft, oily carcases which will not harden when chilled, and even when cured as bacon are so oily as to be practically useless to the trade. Even when used for smallgoods this soft meat is very unsuitable and difficult to handle.

The loss to the industry is very considerable and the bacon factories have already degraded soft pigs and paid for them at reduced rates, and as the supply still continues the factories are considering taking more drastic action, as they do not want these soft oily pigs. The Department of Agriculture and Stock, therefore, offers the following advice to pig-raisers:—

Although several foods may be responsible for the soft condition, all the evidence points to the fact that the chief cause of the present trouble is the feeding of peanuts to pigs which are being prepared for market. Maize and other pig foods are relatively scarce and as peanuts produce particularly fast growth in pigs, farmers are naturally tempted to use them just now. The position could be relieved if pig-raisers would concentrate their peanut feeding on the breeding stock and sucking pigs, which will make very good use of the peanuts, and then all the other available foods could be kept for the pigs from the weaning stage until they reach bacon weight. Separated milk, root crops, pumpkins, lucerne (either as green fodder, hay, or chaff), and small quantities of pollard, meat meal, and pasture can be used to make up good rations in the absence of maize.

# Banana Leaf Spot.

## PROGRESS REPORT.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

FOR the purpose of this report it has been found convenient to divide the matter into two main sections. The first deals with experiments directly applied to seeking methods of control, while the second considers the characteristics of the causal organism itself. Finally, two short sections are devoted to some other factors contributing to loss of foliage.

## I. FIELD EXPERIMENTS.

### (a) Dusting and Stripping—1928.

The first field work was made possible through the kind co-operation of Mr. Richardson, of Belli Park, who offered to carry out on his plantation experiments directed towards the control of leaf spot.

The work consisted in testing the efficiency of stripping with and without dusting. An acre block of twelve-months-old plants was used, a strip of 10 by 8 plants in this area receiving both dust and stripping —the rest being stripped only. An adjacent plantation served as a control. Stripping consisted in removing all spotted leaves present. Dusting operations were carried out in the early morning in the presence of dew, a copper sulphate-lime dust being used in the earlier applications and a copper carbonate-kaolin dust in the later applications.

The plants were stripped six times between 29th March and 16th August, 1928. Dust was applied on 23rd April, 1928, and on six subsequent occasions ending with 14th August. Unfortunately no appreciable control was evident as a result of these operations.

### (b) Stripping—1928-29.

Somewhat later in the same year an experiment was initiated to determine whether a rigorous removal of all spots in their pre-fruiting stages during the early part of the leaf spot spreading period would sufficiently check the spread of the disease as to make the operation profitable. It might be pointed out that the first development of the disease in the new year is sufficiently light to render this operation not altogether unreasonable.

For this work we are indebted to Messrs. E. and L. Ball, of Eumundi, who offered their 2½-acre plantation for use in the experiment, and also supplied much of the labour necessary. Approximately two-thirds of the plantation, consisting of twelve rows, was thoroughly cleared of all affected leaves at the end of the 1928 winter. By keeping a careful watch on the development of the disease entire leaves or portions thereof on which spots appeared were removed in most cases before spores had formed. These removals took place on 28th November, 1928, 30th January, 1929, 3rd March, 6th, 11th, 17th April, and 1st May. Of the remaining one-third of the plantation two-thirds was left untreated as a control and one-third received the winter clean-up only.

Observations made on 10th July, 1929, showed that although the plants from which spots had been removed showed up to some slight advantage over the untreated, this advantage was not sufficient to justify the time and labour involved in the operation.

### (c) Cover Cropping—1928-29.

An attempt was made to determine the effect of the presence of a cover crop during the later summer months when leaf spot commences to develop. In the above experiment at Messrs. Balls's plantation a portion of the area to be kept free of leaf spot continuously and of that stripped at end of winter only was planted to giant cowpea during the spring of 1928. Unfortunately, owing to a period of abnormal dry weather following, a good cover of the ground could not be obtained and no results were available.

With establishment of the Banana Experiment Station at Kin Kin all experimental work was transferred to this locality. The work attempted may be summarised as follows:—(1) Fungicidal treatment of suckers; (2) effect of spacing on leaf spot development; (3) effect of different methods of stripping; (4) control by application of fungicidal dusts.

### (d) Fungicidal Treatment of Suckers—1928-29.

Suckers and "bits" of a fairly even type were prepared by the usual paring process and subjected to the following treatments immediately prior to planting in December, 1928:—

Row 1—Untreated (control).
Row 2—Mercuric chloride—1 in 500 for 1 hour.
Row 3—Mercuric chloride—1 in 500 for ½ hour.
Row 4—No treatment (control).
Row 5—Mercuric chloride—1 in 1,000 for 1 hour.
Row 6—Mercuric chloride—1 in 250 for 1 hour.
Row 7—No treatment (control).
Row 8—Mercuric chloride—1 in 250 for ½ hour.
Row 9—Mercuric chloride—1 in 250 for ¼ hour.
Row 10—Untreated (control).
Row 11—Copper sulphate (bluestone)—2 per cent. solution for ½ hour.
Row 12—Copper sulphate (bluestone)—4 per cent. solution for ½ hour.
Row 13—No treatment (control).
Row 14—Mercuric chloride—1 in 1,000 for 1 hour.
Row 15—Mercuric chloride—1 in 1,000 for 1 hour.
Row 16—No treatment (control).
Row 17—Formalin—1 per cent. commercial formaldehyde, ½ hour.
Row 18—Formalin—3 per cent. commercial formaldehyde ½ hour.
Row 19—No treatment (control).

The treatments were planted in the order mentioned, using 30 plants to the row. Rows 1 to 9 were repeated twice.

The obtaining of accurate results was rendered somewhat difficult owing to the steepness of the plantation, which made comparisons difficult, and to the fact that beetle borer caused the death of a number of plants.

None of the treatments appeared to have a detrimental effect on subsequent growth. However, as the young plants developed isolated spotting appeared more or less intermittently on the lower leaves, no particular treatment showing marked freedom. No distinguishing differences were noticeable as the plants approached maturity.

The origin of these early infections is uncertain and the possibility of their being due to air-borne spores cannot be overlooked. As the

station area was being planted up for the first time it was itself free from sources of infection. However, a heavily infested neighbouring plantation was less than ¼-mile distant.

No significant differences could be detected in the root condition of the treated plants.

In conjunction with the steeping of banana suckers an analysis was made to determine the loss in strength of mercuric chloride during the dipping process. The results indicate that this loss is considerable and has to be allowed for if it is desired to maintain the solution at its orginal strength. The presence of exuded sap associated with freshly pared suckers may be largely responsible for this loss.

The figures for this analysis are as follows:—

| | Mercuric Chloride. |
|---|---|
| Solution before immersion .. .. .. .. .. | 1 in 1,030 |
| Solution after immersion, 700 plants 1 hour .. .. | 1 in 10,000 |
| Solution after immersion, 800 plants 1 hour .. .. | 1 in 20,000 |

### (e) Spacing—1928-30.

A block approximately 10 chains deep was planted up in December, 1928, in the following order, running from east to west:—(1) Six rows 6 feet by 6 feet; (2) six rows 9 feet by 9 feet; (3) six rows 12 feet by 12 feet; (4) six rows 15 feet by 15 feet. Very little desuckering was practised throughout this block.

Observations made during the succeeding two years disclosed no significant difference as regards leaf spot development. Those plants in the 6 by 6 plot showed somewhat less Cercospora spotting. On the other hand speckle was present in this section to a considerable extent, owing to the crowded conditions, and a fair amount of leaf death could be attributed to this cause. Speckle was almost absent throughout the 12 by 12 and 15 by 15 plots. Definitely there could not be said to be any difference in the leaf spot incidence sufficient to justify disregarding the dictates of the best planting practice—the 6 by 6 and 15 by 15 both possessing disadvantages from the cultural point of view.

In connection with the spacing and steeping experiments we are indebted to Mr. H. J. Freeman, Acting Manager of the Station, who was responsible for carrying out the field work.

### (f) Dusting—1930.

Two plots, each containing 140 stools spaced 10 by 10 feet, were taken within the confines of the plantation. An untreated area of equal size separated the two plots.

Plot No. 1 received a dust consisting of copper carbonate 7 per cent. CuO, sulphur 40 per cent., kaolin filler 53 per cent. Plot No. 2 received a copper carbonate dust containing copper carbonate 10 per cent. CuO and filler.

The first application was made on 21st January, 1930. Stools at this time were two years old and each contained 2-3 plants in various stages. From 2½ lb. to 4½ lb. of dust per plot per application were used, the increase being due to increased foliage development. The time occupied in treating each plot was from 3 to 4½ hours. In most cases an attempt was made to apply the dusts in the early morning before the

dew had left the plants. As was to be expected from Queensland conditions rain interfered with the efficacy and proper spacing of the applications.

Dusting was carried out on the following dates:—

21st January (interrupted by wet weather).
3rd, 10th, 17th (interrupted by wet weather), 21st February.
5th, 18th, 25th March.
2nd April.
20th May.
6th, 14th, 18th June.
8th, 19th July.
4th August.

At no stage during the course of the applications or subsequently could any benefit be observed from the treatment, this notwithstanding the fact that the applications were made as efficiently as could be expected on a commercial scale. This failure to control the disease is in accordance with the results obtained previously from Mr. Richardson's work.

There are possibly three main causes for the failure:—(1) The banana leaf provides a large area to be covered and the shiny and waxy nature of the surface makes it practically impossible to obtain good adherence; (2) the heavy rains normally occurring in the main banana-growing districts during the summer and autumn months make it difficult to find suitable opportunities for dusting, and when these are obtained the chance of rain following shortly and removing the greater portion of the fungicide is always great; (3) the copper carbonate dusts used in the experiment, although the best available at the time, would no doubt be less efficient than a copper sulphate-lime preparation. However, the practical difficulties outlined in (1) and (2) above make it appear doubtful whether any of the known fungicidal dusts would be of sufficient advantage to justify their use against this disease. It might be pointed out here that the application of a wet spray is beset with many practical difficulties in the majority of Queensland plantations owing to the steepness of the slope on which they are situated and the lack of suitable water supply.

**(g) Stripping—1929-30.**

This experiment was based on observations which indicated that leaf spot attacked successively from the lower to the higher leaves of a plant, the source of infection apparently being to a large extent the lower leaves of the same or adjacent plants. It was thought that by removal of the infected leaves the rapid spread of the disease might be checked. Furthermore, by the removal of healthy leaves above those in a stage fit for infection a break to further advance would be formed. Each treatment was applied to three adjacent rows of 24 stools each. The spacing was 10 by 10 feet. The layout of the plots and the nature and date of the stripping were as follows:—

(C1) Control.—No treatment.

(1) 5th December, 1929.—All spotted leaves and the two lowest healthy green leaves removed.

(2) 5th December, 1929.—All spotted and the two lowest healthy green leaves removed.

21st February, 1930.—All spotted and the three lowest healthy green leaves removed.

(C2) Control.

(3) 5th December, 1929.—All spotted and the two lowest healthy green leaves removed.

30th January, 1930.—All spotted and the one lowest healthy green leaf removed.

21st February, 1930.—All spotted and the two lowest healthy green leaves removed.

25th March, 1930.—All spotted and the three lowest healthy green leaves removed.

(4) As (3), except that spotted leaves only were removed.

(C3) Control.

(5) 5th December, 1929.—All spotted and the two lowest healthy green leaves removed. Subsequently these plants were kept as free as possible of spots and spotted leaves by their removal at fairly frequent intervals until the last stripping on 26th September, 1930.

(6) As (1), 5th December.—All spotted and the two lowest healthy green leaves removed.

(C4) Control.

Insomuch as the amount of leaf spot present depends largely on the stage of development of the individual plants it was difficult to ascertain with certainty the relative incidence of leaf spot throughout the plots. In order to form some comparison a count was made on 26th March, 1930, of the number of unspotted leaves on all of those plants bearing a bunch which had reached the stage at which the floral organs turn black. The results are given in Table 1.

TABLE 1.

INFLUENCE OF STRIPPING ON THE LOSS OF LEAVES FROM LEAF SPOT.

| Plot Number. | Number of Plants Available for Counting. | Average Number of Disease-free Leaves per Plant. |
|---|---|---|
| 2 | 11 | 3·4 |
| 5 | 16 | 3·1 |
| 1 | 16 | 3·0 |
| 4 | 11 | 3·0 |
| C2 | 13 | 2·7 |
| C3 | 16 | 2·7 |
| C1 | 12 | 2·5 |
| 6 | 12 | 2·3 |
| C4 | 7 | 2·3 |
| 3 | 9 | *2·1 |

* Stripping including three healthy leaves had been carried out on this plot one day before counting hence low average.

Owing to the small number of plants approximately of equal age available for counting no great significance can be attached to these figures.

By August very little difference could be noted between treated and control plants as regards leaf spot incidence except in the case of Plot 5, from which the disease was practically absent, but many plants had been defoliated during the process. The state of affairs at this time may have been largely due to the proximity of sources of infection to be found in the control rows and the adjacent portions of the plantation. That such was the case is also suggested by the fact that in the above counts the rows farthest from the control plants usually showed up better as regards healthy leaves present.

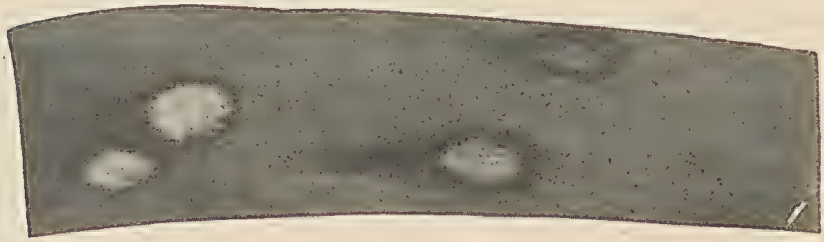
Although no definite conclusions can be derived from this experiment, a trial of a procedure such as that of Plot No. 2 over the whole of a fairly isolated area might yield better results. One likely to prove most useful without entailing too much labour would be somewhat as follows:—(1) A thorough clean up of the plantation after the new spring growth has commenced. All spotted and damaged leaves to be removed and destroyed. (2) The plants to be trashed again in January or early February before the wet season sets in. As well as spotted leaves, three or even four of the lower healthy leaves to be removed. An alternative might also be tried. (1) A clean up at the end of winter. (2) Trashing, including three healthy leaves, at the end of January. (3) Trashing, including three healthy leaves, at the end of February.

One point brought out by this experiment was that under the conditions obtaining at the time a banana plant will stand having a number of its healthy leaves removed without showing ill effects. The only plants showing definite evidence of harmful results arising out of the stripping necessary in the above experiment were those of Plot 5, when the continued removal of leaves or leaf portions showing spots led in many cases to complete defoliation. In this case the plants losing most of their leaves showed the lack of the usual shade and nourishment in the smallness of the bunch and stunted nature of the fruit.

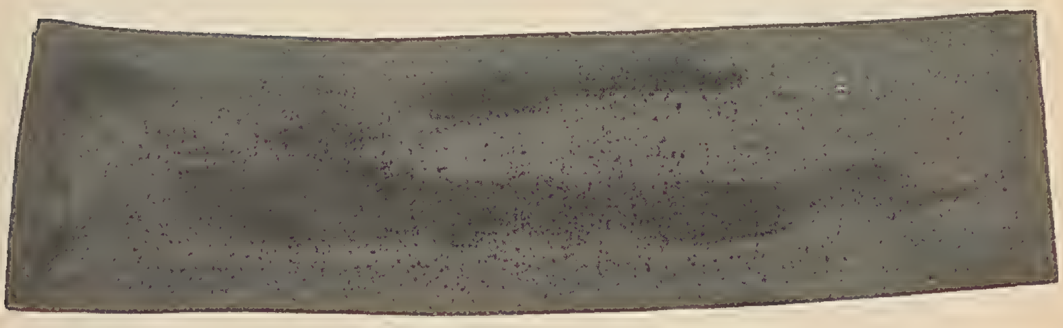
We have to thank Mr. Collard, Acting Manager of the Station, for superintending the field work associated with the dusting and stripping experiments, and also for many observations made in connection with them.

### (h) Varietal Susceptibility.

The presence of a number of banana varieties in the one locality at the Kin Kin Station enabled some idea to be obtained of the varietal susceptibility to leaf spot. The Gros Michel and Cavendish appear to be outstanding in their susceptibility, the former being badly attacked in spite of its taller and more open habit of growth. The Lady Finger and Sugar varieties on the Station appeared to be less affected by the disease, but on other occasions the former has been known to be attacked with the same severity as the Cavendish. The Red Dacca showed up to best advantage and appeared definitely resistant. Unfortunately this is the only occasion in which observations have been made with this variety, which, moreover, is of little commercial use at present. The Mons Marie, a variety producing a bunch similar in type to the Cavendish, though on a taller stem and probably representing a sport from the latter, exhibits a susceptibility equal to that of the Cavendish itself.



A.



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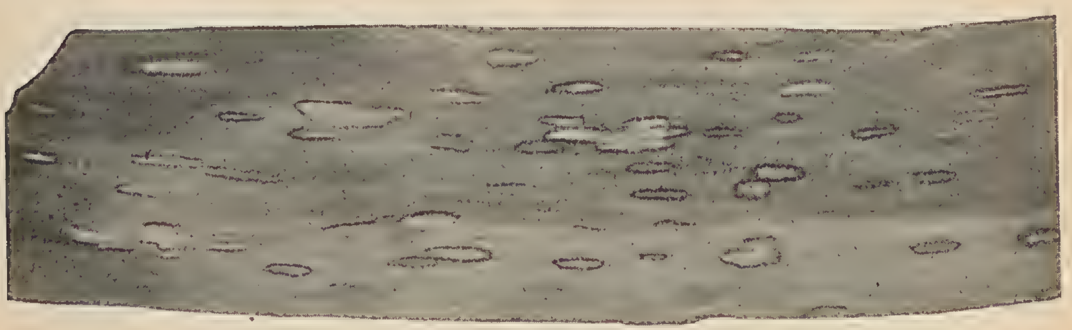

C.

Plate 6.—Banana Leaf Spot.

A. The broad type of spot found on the first-formed leaves. B. Spots in the brown stage, surrounded in some cases by dying tissue. One example of the streak stage. C. The grey centre stage showing up conspicuously on dry leaf killed by the disease.

## II. LABORATORY WORK.

### (a) The Causal Organism.

A considerable amount of work on the etiology of banana leaf spot has been performed by J. G. C. Campbell (1, 2), Government Mycologist, Fiji, who visited Queensland in 1926 with a view to studying this banana disease and comparing it with a similar disease occurring in Fiji. He was able to show as a result of his investigations that the diseases in the two countries were identical symptomatically, and that the Cercospora associated with the lesions in Queensland is similar both morphologically and culturally with the one occurring in Fiji.

This organism from a consideration of morphological characters would appear to be similar to that originally described by Massee in 1914 from Fijian material as *C. musæ* Mass. Campbell further quotes a letter received from S. F. Ashby, Imperial Mycological Institute, who points out an error in Massee's original description and suggests that *C. musæ* Mass. is probably identical with *C. musæ* Zimm. described from Java in 1902. The latter name should therefore stand.

Our own measurements made from material collected in various districts of this State serve to confirm those dimensions given by Campbell for the Queensland species. Culturally our experience has also largely coincided with his so far as the work has been comparable. The canary yellow flourescence noted by him in certain cases has not been seen.

Support can also be given to Campbell's references to the occurrence of a similar disease in other countries of the Indo-Malayan region.

*Cercospora musæ* Zimm. has been recorded from Ceylon[3], though at the time of the writer's visit in February, 1932, the disease was not in evidence, and it is there regarded as of no great importance.

In the Federated Malay States a leaf spot similar to the Queensland one was observed in several districts. In one commercial area where the plants were suffering from poor cultural conditions the disease was present to an extent comparable with the situation here. Cultures obtained from material collected in this locality resemble those of the Queensland species. Spore measurements also support the view that the causal organism is the same. (Table 2.)

*Cercospora musæ* was described on *Musa sapientum* from Buitenzorg in Java by Zimmerman in 1902. As the disease is held to be unimportant, although common, little further attention has been devoted to it in this country.

The morphological characters in the original descriptions of *C. musæ* Massee and *C. musæ* Zimmerman, as well as those of Campbell and our own, are given in a summarised form in Table 2. When consideration is given to the variability in the morphological characters of *Cercospora* species it appears evident that we have in Queensland a disease of bananas common to other countries of the Indo-Malayan region and the Pacific. The causal organism of this disease is *Cercospora musæ* Zimm.

TABLE II.

SPORE MEASUREMENTS OF CERCOSPORA MUSÆ ZIMM. FROM VARIOUS SOURCES.

| Author. | Origin of Material. | Number of Spores. | Length (Microns). | | | Breadth (Microns). | | | Number of Septa. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Minimum. | Maximum. | Average. | Minimum. | Maximum. | Average. | Minimum. | Maximum. | Average. |
| Zimmerman (4)* .. | Java .. | .. | 60 | 80 | .. | .. | .. | 4 | 5 | 6 | .. |
| Massee (5) .. .. | Fiji .. | .. | 60 | 75 | .. | †4 | †4·5 | .. | 0 | few | .. |
| Campbell (2) .. | Fiji .. | 100 | 23 | 66 | 43 | 2 | 5 | 3·5 | 0 | 4 | 2 |
| Campbell (2) .. | Queensland | 150 | 20 | 80 | 51 | 2 | 6 | 3·7 | 0 | 6 | 3 |
| Original .. .. | Queensland | 120 | 21 | 80 | 49 | 3 | 6 | 3·7 | .. | .. | .. |
| Original .. .. | Malaya .. | 80 | 40 | 81 | 59 | 2·5 | 3·5 | 3 | 1 | 6 | 4 |

* Numerals in parentheses refer to literature cited.

† Ashby's correction. *Vide* Campbell (2).

Why leaf spot should have reached epidemic proportions in Fiji and Queensland and yet be regarded as of little importance in other countries is a point still to be determined. Campbell has suggested that its seriousness in the two localities mentioned may be due to close cultivation, general conditions of growth, and favourable environmental factors and, perhaps, to the variety of banana cultivated. This probably indicates the correct state of affairs, the importance of each factor being in the order mentioned. It is interesting to note that in Java a heavy leaf spot infection is usually held to be an indication of poor growing conditions or the presence of panama disease.

**(b) Ascomycete Association.**

Perithecia, pycnidia, and Colletotrichum acervuli may occasionally appear on old leaf spots. An attempt was made to locate a perfect stage of *C. musæ,* but without success. Amongst those most commonly occurring are two species of *Leptosphæria* with five and three septate spores respectively. The latter resembles in its morphological characters *L. musarum* Sacc. and Berl. In culture neither of these fungi resemble *C. musæ,* and their occurrence also on dead leaves apart from the Cercospora spots themselves suggests that they are present merely in a saprophytic capacity.

**(c) Spermagonia.**

Spermagonia may be formed in old leaf spot lesions after the leaf has died and dried out. They are to be found most commonly towards the end of the year on the dead trash hanging down round the pseudostem of the plant. Macroscopically these structures appear not unlike the black points formed by the pulvini of old conidial fructifications, the spermagonia, however, being, as a rule, of a more clearly defined dot-like appearance. They may be formed on both upper and lower surface, more commonly on the latter.

Microscopically the spermagonia appear as small, black, immersed, flask-shaped structures arising within the stromatic base of the old conidial fructifications or quite apart from these. The spermatia are very minute oblong hyaline cells, almost bacteria-like, which may be seen oozing from an ostiole at the apex of the spermagonium. The measurements are as follows:—Spermagonia 50-77 by 34-56 $\mu$ averaging 53 by 63 $\mu$; spermatia 1 by 4 $\mu$. The few attempts made to germinate the spermatia have had negative results.

### (d) Fructification in Culture.

In an attempt to reproduce conidial, perithecial, or spermagonial stages in culture a number of media have been used. These were as follows:—

- Potato dextrose agar
- Plain agar
- Prune agar plus 20 per cent. sucrose
- Prune agar plus 40 per cent. sucrose
- Meat extract agar
- Malt extract agar
- Oatmeal agar
- Corn meal agar
- Leonian's medium
- Czapeck's medium
- Rice
- Cercospora-infected green and dry banana leaf agar
- Papaw agar
- Papaw petiole
- Passion fruit rind
- Mandarin stem
- Banana fruit and skin
- Banana leaf and midrib
- Old agar culture of Cercospora sterilised
- Mixed strains on potato dextrose agar.

Growth on these media may be of a compact mound-like type, grey at first, with or without a light pinkish overgrowth appearing later such as occurs on potato dextrose agar, or it may be of a more spreading grey velvety or irregularly tufted type, as for example when on banana fruit and midrib. A black substratum is, however, common to all media used with the exception of plain agar. Forming part of this there are in most strains dark pycnidia-like bodies. These structures are more or less distinct according to the strain or media used. In the more definite cases they consist of irregularly rounded bodies of varying size formed by a closely interwoven layer of hyphæ surrounding a central mass of loose hyaline cells. It is considered possible that these bodies represent immature spermagonial or perithecial structures. Further work along this line is in progress.

### (e) Temperature Reactions.

The temperature reactions of *C. musæ* in culture are illustrated graphically by a growth-temperature curve in Graph 1. No great variation was noted in the six strains used in compiling this curve. The optimum appears to lie between 25 degrees and 26 degrees C., although fair growth may be expected between 20 degrees and 28 degrees C. Growth ceases at about 32 degrees C. in the upper range and 9 degrees C. in the lower.

Spore germination does not appear to be affected by temperature in quite the same manner as vegetative growth, as illustrated by the germination curve included in the same graph. The optimum is as high as 29 degrees C. While the upper range is greater the lower range is less than for vegetative growth. At the lower temperatures germination increases with time, and after forty-eight hours a fair percentage may be expected at as low as 15 degrees C.

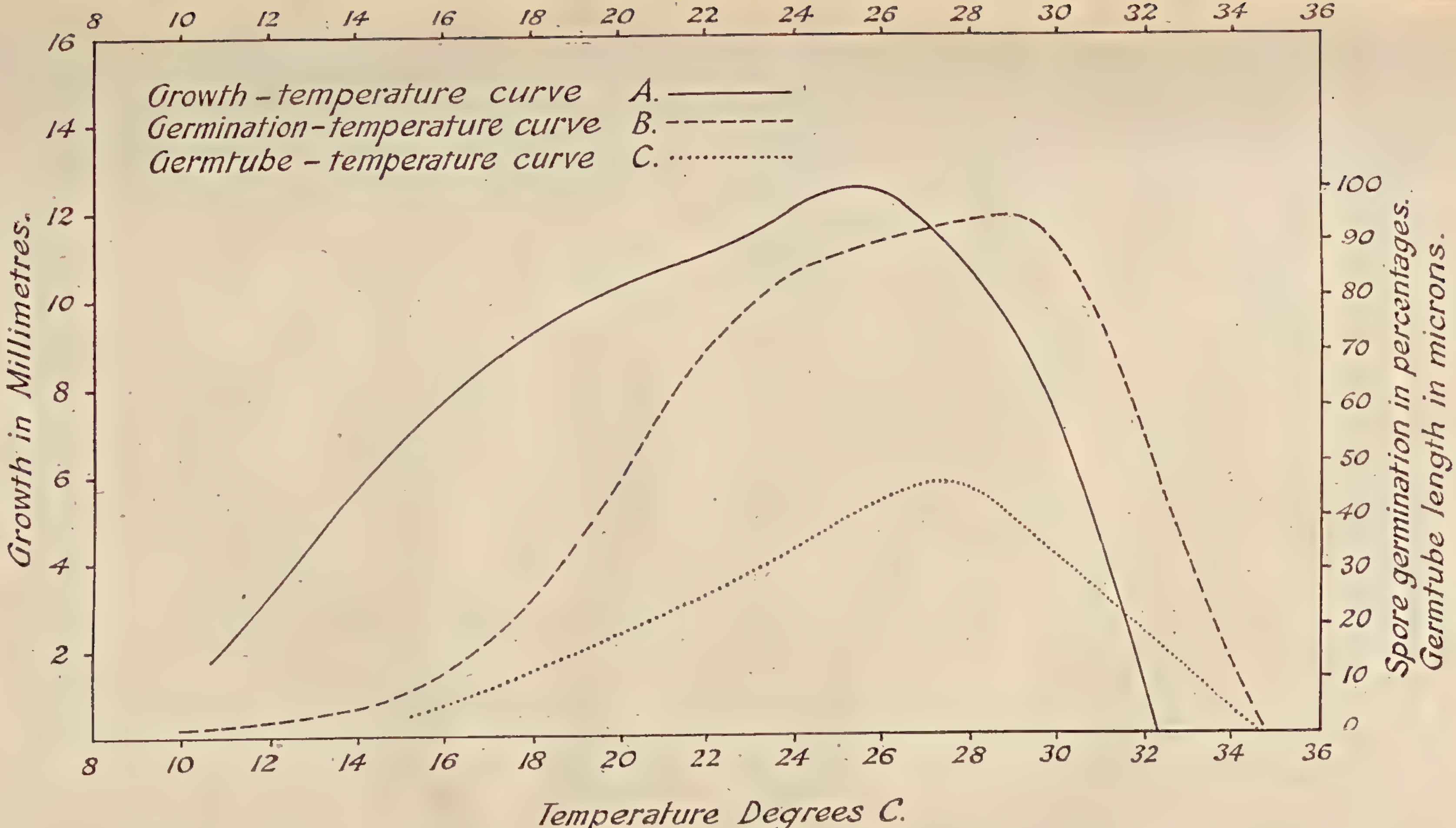


Plate 7.

Graph I. Temperature reactions of *Cercospora musæ* Zimm. A. Growth-temperature curve averaged from six strains. Twenty-six and twenty-one days' growth in the case of four and two strains respectively on potato dextrose agar. B. Germination-temperature curve. Percentage germination after twenty-four hours in banana leaf infusion, average of two series. C. Germtube-temperature curve indicating germ tube development in microns after twenty-four hours in banana leaf infusion, average of two series.

As might be expected the germtube-temperature curve lies intermediate between those just discussed.

A preliminary attempt to ascertain the effect of humidity on spore germination indicated that germination practically ceased below 80 per cent. relative humidity.

These results are consistent with the rapid development of the disease during the early autumn months when average temperature conditions coincide with those favoured by the fungus.

### (f) Artificial Infection.

In connection with the application of fungicides it was deemed necessary to determine whether infection could take place through both or one only of the leaf surfaces. Artificial infection was, therefore, attempted, using four methods—(1) spraying a spore suspension on to the leaf surface with and without subsequent inclosure in a glacene sleeve; (2) by enclosing the inoculum within a small cell affixed to the leaf; (3) by laying a leaf over a support and covering the surface with a bell jar; (4) by pinning spore-bearing lesions to the leaves of a plant left naturally exposed.

Owing to the fact that spore formation in culture had not been obtained the inoculum consisted of spore scrapings from natural leaf lesions.

Infection was only obtained in the instances where the application was by means of spraying with or without subsequent bagging. In these cases typical lesions formed about four months after inoculation. These occurred on the portions inoculated from the upper and the lower surfaces, both sides of the leaf appearing to be equally susceptible to invasion.

### (g) Developmental Stages.

Another point of some interest in connection with control methods is the time taken for lesions to mature and develop spores. For sake of convenience leaf spot lesions can be said to show three stages in their development.

(1) The early or streak stage.—This is the earliest visible symptom of the spot and consists of a very light greenish-brown, somewhat indistinct, narrow streak of about 5 to 10 mm. long by 1 mm. or less in width running in a direction parallel to the veins of the leaf. These may at times be seen scattered in abundance over the upper surface. For some reason not at present understood it may be only a small proportion of these spots which develop further and reach maturity.

(2) The brown stage.—In this the lesion expands laterally to become elliptical in shape and turns first a light and then a dark brown to almost black colour. If conditions are suitable spores may be formed when this stage is reached. Under certain conditions, mainly towards the end of winter and usually when infection appears to have been specially abundant so that the spots are closely situated, the original narrow type of lesion does not expand laterally but merely darkens and forms a narrow line of fructification. This type of lesion often bears spores when the normal type is fruitless. It is, moreover, the only type on which spores may be expected to be found after the leaf has dried out.

(3) The grey centre stage.—The original elliptic lesion dries out to a light grey with the bases of the old fructification showing up as scattered black dots.

Only field observations are available for data in connection with the development of these stages. Individual lesions were ringed with indian ink and the subsequent development noted. It is apparent from these, however, that the development may be very erratic. Of the early stage lesions of one generation some may proceed to spore-bearing stage, while others remain without apparent alteration.

No data are available regarding the time elapsing from the incidence of factors stimulating spore germination until the development of early visible symptoms. In the laboratory spore germination takes from 12 to 18 hours or even longer at optimum temperature, and the fungus itself is relatively slow-growing, as evidenced by the fact that four to ten days elapse before colonies appear macroscopically visible in culture. Hence possibly several days are necessary for the period in question.

The following are the data to hand regarding subsequent development:—(1) Time taken from early stage to brown stage with, in some cases, the first signs of fruiting pulvini—3 to 30 days. (2) From early stage to spore formation—8 to 30 days. (3) From early stage to grey centre stage—10 to 30 days. The observations on which these records are based were necessarily limited, and it is probable that under different conditions these results would have to be revised. Mr. Collard, Manager of Kin Kin Experiment Station, has supplied a number of the figures used in this connection.

### (h) Seasonal Occurrence.

With the help of Mr. Collard an attempt was made during the 1930 season to correlate outbreaks of leaf spot with meteorological conditions. In one series of stripping experiments all spotted leaves were removed from three adjacent rows of 24 plants, each at fairly frequent intervals throughout the season. In order to gain some idea of the extent of leaf spot development at different periods, Mr. Collard noted the number of leaves removed on these occasions. In Table 3 are given the figures so obtained from the plot as a whole.

TABLE 3.

SEASONAL DEVELOPMENT OF LEAF SPOT AS INDICATED BY REMOVAL OF INFECTED LEAVES.

| Date of Stripping. | Number of Leaves Removed. | Average Daily Leaf Infection between Strippings. |
|---|---|---|
| 8 January | 30 | 0·9 |
| 30 January | 7 | 0·3 |
| 7 February | 15 | 2·1 |
| 21 February | 313 | 22·4 |
| 1 March | 381 | 47·6 |
| 12 March | 322 | 29·3 |
| 20 March | 138 | 17·3 |
| 25 March | 19 | 3·8 |
| 2 April | 120 | 15·0 |
| 15 April | 120 | 9·2 |
| 17 May | 113 | 3·5 |
| 10 June | 213 | 8·9 |
| 17 June | 169 | 24·0 |
| 24 June | 180 | 26·0 |
| 1 August | 130 | 18·5 |
| 30 August | 89 | 3·0 |
| 26 September | 220 | 8·5 |

These figures have been compared graphically with average relative humidity, average temperature, and rainfall for the first eight months of the year.

Very much closer attention to field developments would have been necessary in order to interpret these figures with entire satisfaction. Two points are, however, worthy of note. In the first place serious outbreaks of leaf spot are not necessarily dependent on cold weather association, as had been suggested previously. In the year under review the peak was reached between 21st February and 1st March after a period of average summer temperatures.

Secondly, it is to be noted that there are two main periods of leaf spot activity, one which had evidently reached its height at the date of the 1st March stripping, and the other at that of 24th June. Both these were preceded by an outstanding prolonged period of high relative humidity accompanied by rain extending in the first case from 20th January to 1st February, and in the second from 29th April to 12th May. Similar periods of high relative humidity are to be found subsequently to this latter, but the average temperature at the time lies well towards the lower limit for the normal growth rate of *C. musæ,* and active development could not be expected. A lower temperature average would also account for the delayed appearance of the second peak as compared with the first.

Assuming that these long periods of high relative humidity have some bearing on the subsequent development of leaf spot, two explanations are forthcoming. In this connection it must be remembered that the minimum period from the commencement of germination to spore formation in mature spots is possibly about ten days, and the maximum thirty days or more. The appearance of the clearly visible brown stage may also be delayed to thirty days. The possibilities are, therefore, as follows:—

Firstly, that a high germination taking place during the two periods of prolonged humidity produced infection which owing to delayed development only became clearly visible in time for the strippings taking place on dates near 1st March and 24th June respectively.

Secondly, that a period of rapid development allowed of a second or even third period of spore production and infection taking place between the first period of prolonged humidity and the peak outbreak—i.e., that the peak is the result of cumulative multiplication.

If the latter is the sole explanation, it is difficult to understand the cessation after the 1st March stripping, as conditions would appear to be as suitable for development to continue as just prior to this time. Possibly a combination of both explanations best meets the case. This will only be definitely decided, however, by the results of more detailed observations than have been possible up to the present.

In addition to those of 1930, further observations made along the same lines in 1929 would indicate that some increase in leaf spot may be expected after three consecutive days with a relative humidity above 80 accompanied by rain. It appears doubtful whether shorter periods of high humidity materially affect the leaf spot position.

Although leaf spot exhibits sporadic outbreaks throughout the winter, with the advent of spring-growing conditions the situation quickly changes. The weather is usually warm and comparatively dry. The plants develop rapidly, with the result that they quickly outgrow any slight advance that the disease may make, so that in a young plantation there is a period of from three to four months in which there is

little evidence of the presence of the disease. In older plantations the plants which have thrown bunches and are no longer producing new foliage may retain the leaf spot on their upper leaves throughout the summer months, and these probably constitute a common means whereby the disease is carried over from one season to the next.

### (i) Longevity of Spores.

Except for an experiment under way at the present time no attempt has been made to test the longevity of spores from any one batch of material.

Spore-bearing lesions were collected on different occasions and after drying retained in the laboratory. The spores were later tested for germination after various intervals had elapsed since collection.

The maximum germination obtained for a given period is contained in Table 4.

TABLE 4.

LONGEVITY OF THE SPORES OF C. MUSÆ ZIMM.

| Date of Collection. | Date of Testing. | Time Retained. | Germination. Per Cent. |
|---|---|---|---|
| 1930— | 1931— | | |
| 26 March .. .. .. | 7 March .. .. .. | 12 months | 0 |
| 16 July .. .. .. | 7 March .. .. .. | 8 months | 0 |
| 4 September .. .. | 7 March .. .. .. | 6 months | 0 |
| 1932— | 1932— | | |
| 8 July .. .. .. | 3 October .. .. .. | 3 months | 64 |
| 9 September .. .. | 3 October .. .. .. | 24 days | 89 |
| 23 September .. .. | 3 October .. .. .. | 10 days | 95 |

These results will need to be confirmed and elaborated by more extensive tests, but it would appear that under the conditions to which they were subjected the spores have not a long period of life.

## III. ENVIRONMENTAL FACTORS CONTRIBUTING TO LOSS OF FOLIAGE.

Although there is no doubt that leaf spot alone is capable of causing serious loss, there are many cases in which the consecutive death of the lower leaves, resulting, in the case of bunch-bearing plants, in more or less complete defoliation simulating leaf spot injury, may arise from other causes. In these instances leaf spot is often blamed for destruction for which it is only partly responsible. Amongst these causes may be mentioned unfavourable cultural conditions, weevil borer and other fungus diseases.

In many of the hillside plantations the soil is of no great depth. The top 6 inches to a foot of light friable soil often merges into a stiff and somewhat clayey subsoil. The eroding action of a semi-tropical rainfall still further reduces the amount of suitable soil available. Associated with this condition it is found that after the heavy summer rains extensive root rot develops and the plants, especially the older ones, may be left almost devoid of sound roots. No doubt fungi and

nematodes play an important part in this rotting, but the primary consideration appears to be the physical and possibly the chemical condition of the soil.

In certain situations where poor drainage is obviously a factor bananas have been seen growing in the absence of leaf spot, and yet exhibiting in the older plants the almost complete defoliation characteristic of this disease. No doubt the severity of the disease when present must often be augmented by the accompaniment of such unfavourable conditions.

A soil which is too porous and dries out quickly is found to be conducive to heavy leaf spot infection.

Magee and Fitzpatrick[6] have recently described a leaf fall of bananas in the Tweed district of New South Wales occurring on land which has been previously depleted by other crops. Excessive dying of the leaves occurs during the winter months until the bunch may be left practically bare, as in the case of severe leaf spot attack. This trouble can easily be rectified by the application of fertilizers.

Towards the end of winter plantations in cold situations often exhibit considerable yellowing and dying of the leaves as a result of exposure to abnormally low temperatures. In rare cases complete defoliation has been noted from this cause.

Weevil borer by acting in much the same way as root rot, that is by cutting down the supply of nourishment and so weakening the plant, is also able to aid leaf spot development. The association in individual plants of heavy leaf spot infection and extensive borer damage has often been noted.

## IV. LEAF DISEASES OTHER THAN LEAF SPOT.

Two other foliage diseases to which the name speckle and yellow leaf spot have been applied are present in Queensland. Both these diseases act in a similar manner to leaf spot in that the lower leaves are first affected, resulting in a gradual loss of foliage from the base up. On occasions these diseases may be responsible for as much loss as leaf spot itself, and more than once they have been confused with the latter disease. These two diseases are briefly described here in order that they may be more readily recognised.

### Leaf Speckle.

Speckle is found on the lower leaves of a plant usually in the more shaded or crowded situations. The symptoms can be seen at first on the under surface. Here there appear irregular light grey patches formed by a close speckling of the surface with greyish dots. The individual dots darken and coalesce as the disease advances, and the leaf surface comes to bear scattered or aggregated dark brown to black blotches of varying size and intensity. The presence of these areas of decay eventually leads to the complete destruction of that portion of the leaf on which they are situated. As in the case of leaf spot, if conditions are favourable speckle will gradually spread from the lower leaves upwards, leaving in its wake dead leaves draped round the pseudostem.

The loss from speckle is much more serious in a thickly growing plantation than in one which is kept well trashed and suckered. Under normal circumstances damp shady conditions appear to be necessary for any considerable development of this disease.

In a number of cases speckle on its own has been known to cause a reduction of the foliage quite comparable with that produced by leaf spot. It is very commonly present in association with the latter disease, and here again it must sometimes be regarded as being equally if not more responsible for the leaf damage occurring. Speckle assumes serious proportions earlier in the year than does leaf spot. The wet conditions of January and February may witness a fairly extensive development, and the disease then remains present to a varying extent throughout the year. A rapid epidemic outbreak such as occurs sometimes with leaf spot and yellow spot is not a feature of this disease.

Microscopic examination shows the presence of fungus in the affected tissue. Isolations have fairly consistently yielded the same organism. This produces on potato dextrose agar a mound-like and slowly spreading colony with a grey compact mycelium which may later develop pinkish areas. The cultural characters of certain strains of this organism resemble those of *C. musæ*. So far no definite fructification has been obtained in culture and the organism remains undetermined.

Speckle-infected areas on leaves which have been dead and dry for some time are often to be found thickly studded with pustules comprising small perithecia of the Mycosphærella type. So far no definite attempt has been made to establish the causal relationship of this organism.

A condition resembling speckle was collected by the writer from bananas in Ceylon. This appeared similar to specimens in the herbarium of the Department of Agriculture, Peradeniya, labelled *Leptosphæria musarum*. As has been mentioned previously a fungus resembling this species has been found in Queensland in association with old leaf spot lesions and elsewhere on the leaf, where it is considered to be present in a saprophytic capacity. In this State it is the *Mycosphærella* which is most consistently associated with speckle.

### Yellow Leaf Spot.

This leaf spot has only been observed so far in two districts of North Queensland. The disease commences in the lower leaves of a plant as somewhat indefinite light yellow areas which gradually enlarge to an elongate elliptic or more characteristically a definite diamond shape. These turn deep yellow and then gradually darken in the centre and dry out to dark brown, leaving a narrow yellow margin. The mature spots may be 3 to 4 inches long by 1 to 1½ inches broad.

The effect of this disease on the plant is essentially the same as that of leaf spot. Commencing on the lower leaves dead areas are found round the spots, which if numerous soon involve the whole leaf. The death of the leaves then ensues from the lower ones up, with the result that a bunched plant may be left with few healthy leaves.

In general yellow leaf spot does not appear to be of such serious consequence as cercospora leaf spot, from which it differs somewhat in being capable of causing serious defoliations in young plantations. That the disease is capable under certain conditions of causing as much damage as leaf spot itself has been shown in one or two plantations where the two diseases occurred together.

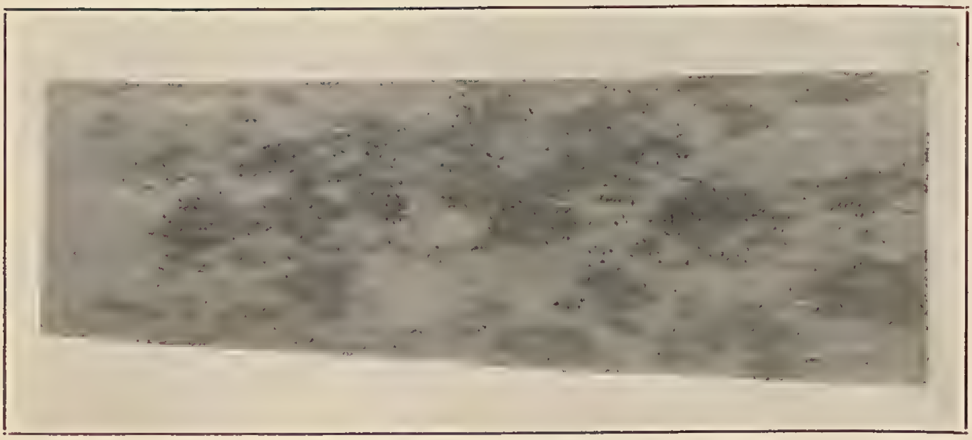

PLATE 8.—LEAF SPECKLE.

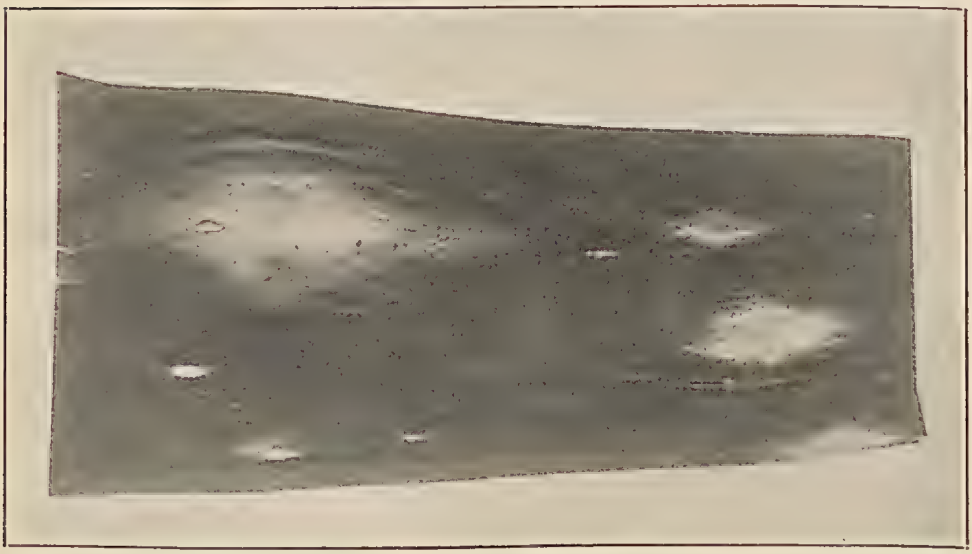

PLATE 9.—YELLOW LEAF SPOT.

Several Cercospora spots are included in the specimen, and form a comparison. (Slightly reduced.)

In yellow leaf spot it appears we have again a disease which is common to the Indo-Malayan region. A leaf spot closely resembling the Queensland one was observed by the writer affecting bananas in Ceylon, Malaya, and Java.

Associated with these spots as well as those from this State is a species of *Scolecotrichum* closely resembling *S. musæ* Zimm. Specimens of a banana leaf spot of somewhat smaller dimensions received from Norfolk Island had a similar organism associated with it. What is apparently the same disease has also been obtained from *Musa Banksii* F.v.M., a species endemic to Queensland.

The fructifications of the *Scolecotrichum* form a greyish down covering the under surface of the spots. This is a characteristic feature of the disease.

The spore measurements of the *Scolecotrichum* obtained from various sources are outlined in Table 5, together with those given in the original description of *S. musæ* Zimm. It will be seen that with the exception of the Norfolk Island material there is little difference to be observed, although all fall somewhat short of the original length measurements. Variation in the conidiophores is somewhat greater, although this is perhaps to be expected.

It therefore appears probable that the species of *Scolecotrichum* associated with yellow leaf spot in Queensland is the same as occurs in similar situations throughout the Indo-Malayan region, and is to be regarded as *Scolecotrichum musæ* Zimm.

TABLE 5.

SPORE MEASUREMENTS OF SCOLECOTRICHUM SPP. FROM VARIOUS SOURCES. TWENTY MEASUREMENTS IN EACH CASE. ALSO ZIMMERMAN'S DIMENSIONS FOR S. MUSÆ.

| Source. | Length (microns). | | | Breadth (microns). | | |
|---|---|---|---|---|---|---|
| | Min. | Max. | Average. | Min. | Max. | Average. |
| Queensland .. .. .. | 13 | 19 | 16·5 | 9 | 13 | 10·2 |
| Queensland (*Musa Banksii*) | 13 | 19 | 16·5 | 7 | 10 | 8·7 |
| Java .. .. .. .. | 15 | 20 | 16·5 | 9 | 15 | 10·4 |
| Ceylon .. .. .. | 15 | 19 | 16·6 | 9 | 12 | 9·9 |
| Norfolk Island .. .. | 19 | 27 | 23·3 | 14 | 16 | 15·2 |
| Java [Zimmerman (7)] .. | .. | .. | 20 | 8 | 10 | .. |

We are not aware of any attempts having been made to prove the pathogenicity of *S. musæ* on the banana. This species is recorded as associated with a disease of *Musa paradisiaca* L. in Ceylon[3], and was originally described from the foliage of *Musa sapientum* L. in Java in 1902. The consistent association of this organism with the disease in such widely separated regions as now recorded would at least lead one to expect some causal relationship.

## Conclusion.

Although it has not been possible to arrive at any definite measures for the control of leaf spot, the ground has been to a great extent cleared for future work.

It must be remembered that two important avenues for the control of plant diseases are largely closed owing to the nature of the banana plant itself. These are the use of a resistant variety—there being apparently no suitable one available; and the use of fungicides. As regards the latter, dusting has been shown to be of little value. Spraying is a practical impossibility in many plantations, but its use might be advisable on others should the exact dates on which applications were necessary be known. The vital point for attacking the disease has been shown to be most probably in the late summer months, and it is possible that some system of strict sanitation during the early part of the year might be found to yield definite benefit. A number of other factors have been shown to cause symptoms which simulate leaf spot damage, and these will have to be overcome in their turn before a satisfactory state of affairs is possible.

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## QUEENSLAND SHOW DATES, 1933.

Royal National Bushmen's Carnival: 20th and 21st January
Stanthorpe: 1st to 3rd February.
Warwick: 14th to 16th February.
Clifton: 1st and 2nd March.
Allora: 8th and 9th March.
Pittsworth: 14th and 15th March.
Milmerran: 21st March.
Goombungee: 23rd March.
Killarney: 24th and 25th March.
Toowoomba: 27th to 30th March.
Beaudesert Camp Draft: 30th March to 1st April.
Oakey: 8th April.
Chinchilla: 11th and 12th April.
Boonah Camp Draft: 15th to 17th April.
Nanango: 20th and 21st April.
Kingaroy: 27th and 28th April.
Wondai: 4th and 5th May.
Murgon: 10th and 11th May.
Beaudesert: 10th and 11th May.
Ipswich: 16th to 19th May.
Goomeri: 18th and 19th May.
Kilkivan: 22nd and 23rd May.
Gympie: 24th and 25th May. Camp Draft: 27th.
Toogoolawah: 26th and 27th May.
Maryborough: 30th May to 1st June.
Marburg: 2nd and 3rd June.
Lowood: 9th and 10th June.
Rockhampton: 20th to 24th June.
Laidley: 28th and 29th June.
Caboolture: 13th and 14th July.
Esk: 21st and 22nd July.
Maleny: 26th and 27th July.
Royal National—Brisbane: 7th to 12th August.
Crow's Nest: 23rd and 24th August.
Nerang: 13th October.

# Notes on the Onion Thrips.

By W. A. T. SUMMERVILLE, B.Sc., Assistant Entomologist.

ALTHOUGH there are more than seventy species of thrips native to Australia, practically the whole of the economic damage attributable to insects of this group is done by species which have been introduced from other parts of the world.

Of these destructive introduced species probably the commonest is the onion thrips, *Thrips tabaci* Lindeman.

The onion thrips is a minute, slender insect not more than $\frac{1}{25}$ inch in length, yellowish in colour, and for the most part very active in its movements about the plant on which it is found. The adult females are rather darker in colour than the males and the nymphs of both sexes, and possess two pairs of very fine wings. The main portion of the wing is very small even for the size of the insect, but on the hind margin of each wing there is a fringe of comparatively long, fine hairs. The immature stages, or nymphs and pupæ, and the adult males are wingless. The males are seldom found, and apparently the female is able to reproduce without having first mated.

## Host Plants.

Mr. A. A. Girault has recorded *Thrips tabaci* from about twenty-five plants in this State. Most of these hosts are weeds and other plants growing apart from cultivation. The number could be considerably increased by the addition of plants of economic importance and plants such as garden flowering species as distinct from economic crops. Lists of the host plants recorded by Girault have already been published in this Journal and, apart from this, it is not considered that any useful purpose would be served by repeating the list here since it is probably by no means complete. In so far as weeds influence the control of the species it is considered advisable that onion growers treat all weeds as potential hosts of the pest and not differentiate between host and non-host amongst the many weeds of the State.

The following plants grown for crop purposes are known to be attacked:—Onion, tomato, bean, cabbage, cauliflower, cucumber, squash, melon, and beet. Practically all these plants suffer severe injury at times.

In so far as onions are concerned, it appears that with the exception of the white "Imperial" all varieties commonly grown in Queensland are subject to attack to about the same extent. Limited observations made recently suggest that, although the pest will attack the "Imperial," this variety is much less palatable to it than are the other common ones.

## Injury to the Onion.

The thrips are to be found on the onion in two stages—the first stage young, or nymphs, and the adults. The nymphs are almost entirely confined to the bases of the youngest leaves, and are therefore hidden from view unless the leaves are held apart. On plants which are flowering or seeding the nymphs apparently habitually ascend the flower stalk in large numbers.

The adults may be found on any aerial part of the plant, but are mostly observed on the older leaves, and are therefore exposed to view. Although the nymphs are smaller than the adults, being grouped together in large numbers, and being of a very distinct yellow colour, they are, however, usually seen first—the more scattered distribution of the adult females and their more sober coloration making them rather difficult to detect. It is, however, essential that growers make themselves familiar with the adult insect if control measures are to be successfully carried out by them. The reason for this will be apparent later.

The main injury is done by the adult thrips. These attack the leaves, tearing away the surface tissue, and imbibing the plant juices. The tearing away of the tissues causes whitish blotches and streaks. This white marking is very characteristic of the damaged plants, and when the infestation is very heavy there may be very little continuous healthy green surface such as is normal to the onion plant.

The most heavily damaged leaves may wither at the tip, and the plant generally may take on an unthrifty appearance. The general appearance of a heavily attacked plant suggests that the bulb is commencing to ripen off, though, of course, the bulb may be less than half grown.

The effect on the bulb itself cannot be stated in definite terms at present. Observations have been limited to fields in which every plant of the one variety has been about equally and heavily attacked. Thus no comparison of attacked and unattacked plants grown under similar conditions has so far been possible.

It is too often found that farmers are apt to ignore the work of pests on their plants because they are not attacking directly the part of the plant in which the grower is most interested. Thus fruitgrowers often neglect a foliage feeder on their trees simply because unless it becomes very severe they do not realise that the whole of the rest of the tree must be somewhat affected. In the same way growers of onions in many cases do not appear to be concerned about onion thrips because the bulb itself is not directly attacked. This attitude is unsafe, and it is considered advisable that (though the effect on the bulb may not be apparent) onion growers should treat the thrips as a serious enemy. Experience in other countries, particularly North America, supports this view.

On certain types of soil in this State there is a tendency for some varieties of onions to produce a bulb which is really too large to command the best market price, and for this reason quite a number of growers appear to think that the thrips may do some good. It may do so, of course, but it is a very poor way of producing the desired size of bulb. For one thing, it is impossible to state that when the size of a bulb is reduced by making the plant somewhat unhealthy that this is the only effect on the bulb. It is almost certain that the characters of the bulb are changed in other ways as well as in size, and the characters of the bulb must include those points which come under the heading of quality. Even if it be allowed that a certain number of thrips do some good, there would certainly be a limit to the number of desirable thrips, and to keep the infestation of any insect at a stated limit is obviously impracticable. Therefore, onion growers would be better advised to treat thrips as nothing but a menace to their crop, and deal with it accordingly.

## Life History and Habits.

Work in Queensland on the onion thrips has been confined, until the recent outbreak, to the collection, identification, and recording of host plants. No opportunity has so far occurred for the study of its life history under local conditions. In the United States of America the insect is of much importance both on onions and other crops, and some attention has accordingly been given to it.

It is found there that the eggs take from five to ten days to hatch, and that the nymphs require from fifteen to thirty days to reach the adult stage.

The eggs are laid on the plant, and the young on emerging remain more or less congregated in batches of up to forty or more, according to the infestation, at the base of the youngest leaves, as described above. Following this stage the insect moults, and the next two stages are passed in the soil. Whilst in the soil the insects apparently do not feed, and are capable of only a very limited amount of movement.

They return to the plant when the adult stage is reached, and again become active. The adults move particularly quickly, but the first-stage young, though capable of rapid movement, usually remain fairly still.

The habit of growth of the onion plant affords excellent protection to the nymphs congregated at the base of the youngest leaves. The youngest leaf during the early part of its growth fits closely into a concavity of the next oldest leaf, and the fitting is so close and the structure of the leaf surface of such a nature that it is scarcely possible to make a spray penetrate to the hiding place of the young between the two leaves. In fact, if the leaves be undisturbed and the plant held under water for several minutes, it is found that the base of these two leaves, where they are in contact, is not wetted. From this it will be seen that ordinary contact sprays are not likely to be of much use against the young owing to the efficiency of the protection which the plant affords the insects in this stage.

Thus direct measures against the pest have to be confined to attacking the adult, and it is for this reason that the life cycle is of importance. Under the circumstances it will, for the present, be necessary for growers to accept the American figures given above as a basis, and make their own observations as to the recurrence of large numbers of adults from time to time. Even if the life history were to be worked out for Queensland conditions it would still be necessary for growers to make some observations for themselves, as the length of the life cycle period would almost certainly vary from year to year as well as from month to month. The lack of knowledge referred to above is thus by no means as big a handicap as might at first appear.

## Natural Enemies.

Two small hymenopterous wasps have been observed amongst the pests on the onion plant, and it is suspected that these are parasitic on the thrips. However, it has not so far been possible to prove this point. At the same time, though the onion thrips is an imported insect, it would appear that either some of its natural enemies have been introduced as well or that some Australian insect or other parasite has found the pest to its liking, otherwise *Thrips tabaci* would be even more

important a pest than it is. Even so, there is no evidence to suggest that the parasites, if present, are so efficient that growers can afford to depend on them to control a heavy infestation at any particular time.

## Control.

An opportunity occurred recently to test out a number of sprays against this pest. A very heavy outbreak of the insect was reported from the Rockhampton office, and arrangements were at once made to carry out experiments to test the relative efficiencies of some of the more promising contact insecticides.

From the habits of the pest as described above it will be at once apparent that the only stage which can be directly attacked in this manner is the adult. Killing the young by means of a spray is not so much a question of finding a material which would act satisfactorily as of finding a way of applying the material in such a manner that the innermost leaves could be thoroughly wetted. There appeared to be no hope of finding a solution for this difficult problem, and the time available was therefore devoted to the testing of sprays against the adults.

As the insects are found on the plant in the young form and as adults concurrently, it is apparent that to combat the pest successfully it was necessary to find an insecticide that would retain its potency over a fairly long period, or, alternatively, to obtain a material sufficiently cheap to allow of its application being repeated twice or oftener at certain times which would depend on the rate of breeding of the pest.

None of the available wet spray materials appeared to have any possibility of fulfilling the first alternative, but it was thought that a dust might be found. For this reason sulphur dust and nicotine dust were tested.

As a second alternative nicotine sulphate, Katakilla, and a local experimental proprietary spray were tried. Of these three wet sprays the lastmentioned insecticide was shown to be of little or no value for this particular purpose.

Sulphur dust was also found to be useless against the pest, whilst the nicotine dust gave no apparent kill. It might be here pointed out, however, that the test could not be considered as proof that nicotine dust was of no value, for the sample supplied was a very poor one, and could not be taken as typical in its action. Time did not permit of a second sample being obtained.

Nicotine sulphate used at 1 to 800 certainly killed a few of the insects, but the results obtained showed that too many applications would have to be made to make its use practicable.

At a strength of 1 to 400, however, the nicotine sulphate gave much better results, but the cost was so much higher than the more promising Katakilla that nothing beyond the preliminary tests was done with it. At the same time there is little doubt that at this strength the nicotine sulphate would have proved effective against the adult stage of the pest.

By far the best result, considered with cost, was obtained in the preliminary tests with Katakilla. This material made to the strength recommended by the manufacturers gave such promising preliminary results that it was decided to concentrate on it in further tests.

Accordingly four beds, each containing three rows of plants, were sprayed with the Katakilla. The plants were examined twenty-four hours later and counts made of the adult thrips on approximately 1,000 leaves. It was found that the average number of adult thrips per leaf on the sprayed plants was 1·9. The number of the insects on each leaf was moreover remarkably constant. The leaves were counted in groups of forty, and the figures obtained show that the number of thrips on the groups was always between sixty-nine and seventy-seven, thus adding to the significance which may be placed on the data.

Counts made at the same time on nearby untreated plants gave the average per leaf as 8·7. It may be necessary to point out that before the spraying was done the plants were examined to see that the infestations on all were about the same.

On these figures it appears that approximately 80 per cent. of the adult insects had been removed by the spraying. Under the circumstances in which the work was done it was impossible to find and count the dead thrips, and the above method, though admittedly open to error, was the only satisfactory one which could be devised.

It is considered that of the factors which would tend to make the obtained figures incorrect those which would make the apparent kill less than the actual were likely to act most strongly.

Of these factors the most important would be migration of adults from plant to plant or from row to row. This would be expected to operate in two ways. In the first place, whilst the actual spraying was being carried out some of the insects might move from one row to the next or from the sprayed beds to unsprayed ones. This would then perhaps tend to increase the number of insects on the unsprayed plants at the expense of the sprayed ones. To partly offset this the ground round the plants was wetted with the spray as it was applied to the plants, and further, in counting the insects, the row next to the sprayed ones was not used. It might also be mentioned that the counts of the plants in the two middle of the four sprayed beds did not differ materially from those of the other two.

In the second place there is the possibility of migration of the adults from the untreated to the treated plants, or vice versa, after the spraying had been finished. If the spray killed any of the pests this must favour an increase in the number of insects to be found on the sprayed plants and a decrease on the unsprayed ones. It is considered that this migration would be the more important of the two, particularly as there was no evidence to suggest that the spray left any residue which might be deterrent to the pest.

It is therefore considered that the stated 80 per cent. is, if anything, an underestimate of the effect of the spray. That this effect was not wholly derived by driving out the pest was shown by the fact that a number of dead were found on several plants.

## Recommendations.

Since portion of the life cycle of the insect is spent under the ground attention to cultural work cannot fail to be of benefit against the pest. Further, the best offset against the depredations of any pest such as this is to keep the attacked plant in the best possible state of health and vigour. One of the best ways of doing this is by the adoption of good cultural practice.

In some districts onions are grown under irrigation conditions, and, particularly where the water is cheap, there is sometimes a tendency to make irrigation a substitute for cultivation. Growers would do well to remember that this is bad policy.

Apart from its place in pure cultural practice, the cultivation should be kept as free from weeds as possible on account of the fact that the onion thrips feeds on so many common weeds. Further, it is advisable for the same reason to keep the weeds on the headlands back as far as practicable from the cultivation.

Spraying is effective only against the adults, and after the pest has become well established will have to be carried out twice or oftener to be of any lasting value. If the thrips occur early in the growth of the plant, *i.e.*, up to about a month old, it may be possible to wet all leaf surfaces with a spray, and thus young may be killed. Even so, however, it is more than likely that a further infestation will take place from outside sources.

With respect to the actual application of the spray, as has been indicated, growers should not waste time and material trying to penetrate the plant to the hiding place of the young. The whole of the exposed portions of the plant should be wetted thoroughly, and the ground round about the plants should also be lightly sprayed.

The interval which should elapse between sprayings will be dictated by the rate of development of the pest, and as this will no doubt vary it is not possible to make any definite statement. Growers will need to make the necessary observations for themselves.

After the first spraying the insects will appear as adults, probably gradually, in greater and greater numbers. They may, of course, appear in heavy numbers rather suddenly, but this is less probable. At all events the time of the next spraying will be determined by the appearance of large numbers of thrips in the adult form. The presence of the young must be ignored in this connection, no matter what their numbers.

It will probably be found that three sprayings will be necessary when the outbreak assumes plague proportions, or when it is neglected in the early stages. From the figures given above it would appear that the three sprayings applied at intervals of a week between each will be followed by the best results. The third spraying is suggested mainly because there is almost certain to be some overlapping of succeeding generations.

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**TO SUBSCRIBERS—IMPORTANT.**

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

## TRANSPORTING DAIRY CATTLE BY AIR.

THE athletic prowess of the cow in the nursery rhyme, through which our infantile interest in high-jumping quadrupeds was first aroused, seems almost within the realms of the possibility visioned by us with the credulity of extreme youth, as we record as an actual fact the transport of Queensland dairy stock by air to the New Guinea goldfields. The cow in this case, however, had no ambition to eclipse the mythical lunar record; it merely flew with its mate over the high mountains between Salamaua and Wau in the territory of New Guinea.

Some little time ago Mr. Arthur Thompson, of Bulolo, who includes dairying among his enterprises, bought some young stock from Messrs. Hickey and Sons, of the Glendalough Stud, Wilston, near Brisbane. Delivery after their arrival by steamer at Salamaua presented serious difficulty, for travelling the stock in the ordinary way by road was out of the question. Lofty and almost inaccessible ranges had to be crossed, and the difficulties of transport otherwise were insurmountable; so the only way to solve the problem was to carry the cattle over the mountains by aeroplane. The animals were duly landed at the headquarters of the Guinea Airways at Lae, and were transported subsequently in one load by the Guinea Airways triple-engine junker plane to Wau without mishap.

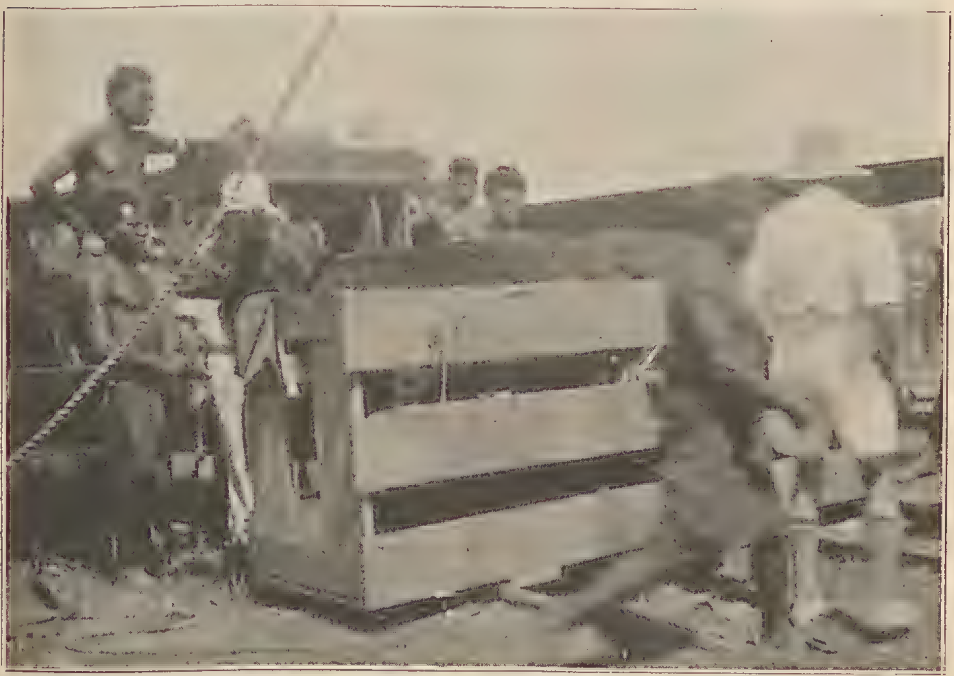

PLATE 10.—YOUNG DAIRY STOCK CRATED FOR AEROPLANE TRANSPORT.

A consignment of A.I.S. cattle from Messrs. Hickey and Sons' Glendalough Stud, Wilston, near Brisbane, to Wau, Territory of New Guinea, to the order of Mr. Arthur Thompson, of Bulolo. Lae, the headquarters of Guinea Airways, was the port of lading.

The undertaking was the first of its kind, and should therefore be of considerable interest to cattlemen and commercial air transporters. So far as we are aware, it is also the first time that an aeroplane has been used for the transport of dairy cattle. The accompanying illustrations tell the story of how it was done.

The cattle consigned to Mr. Thompson were an A.I.S. heifer, "Glendalough Scarlet," by "Don of Springdale," from "Scarlet of Pine View"; and a young bull, "Glendalough Commodore," by "Young Commodore of Springdale," from "Redwing IV. of Upton."

The consignment was the second from the Glendalough stud to Wau. The first was disastrous. After landing at Salamaua the stock were started on the road, the droving outfit consisting of twenty native boys with provisions for six weeks. The country traversed was most difficult, and long and weary detours through trackless mountain ranges were necessary. The cattle died on the road.

The second consignment was carried by 'plane and delivered at its destination without loss in forty minutes. The freightage was at the rate of 6d. per lb. Further consignments are in view, and the aeroplane will again be employed by Mr. Thompson as the quickest, cheapest, and safest means of transport in that part of New Guinea.

We are indebted to Mr. C. J. Hickey for the use of the photographic prints from which our illustrations were made.

PLATE 11.—READY FOR THE LIFT AT THE LAE AERODROME.

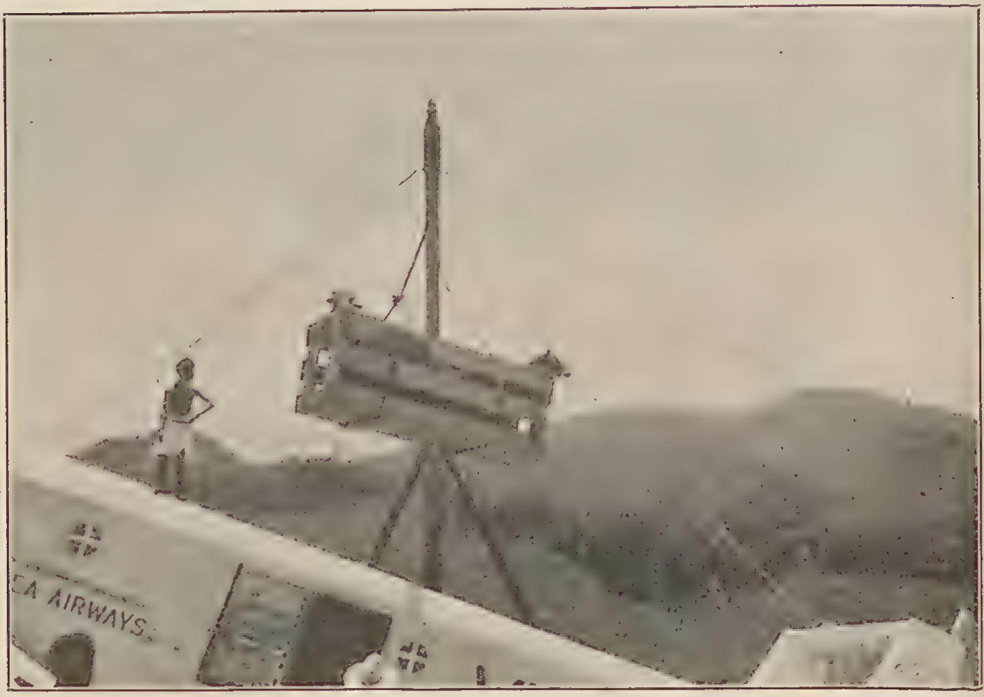


PLATE 12.—IN THE AIR FOR THE FIRST TIME.

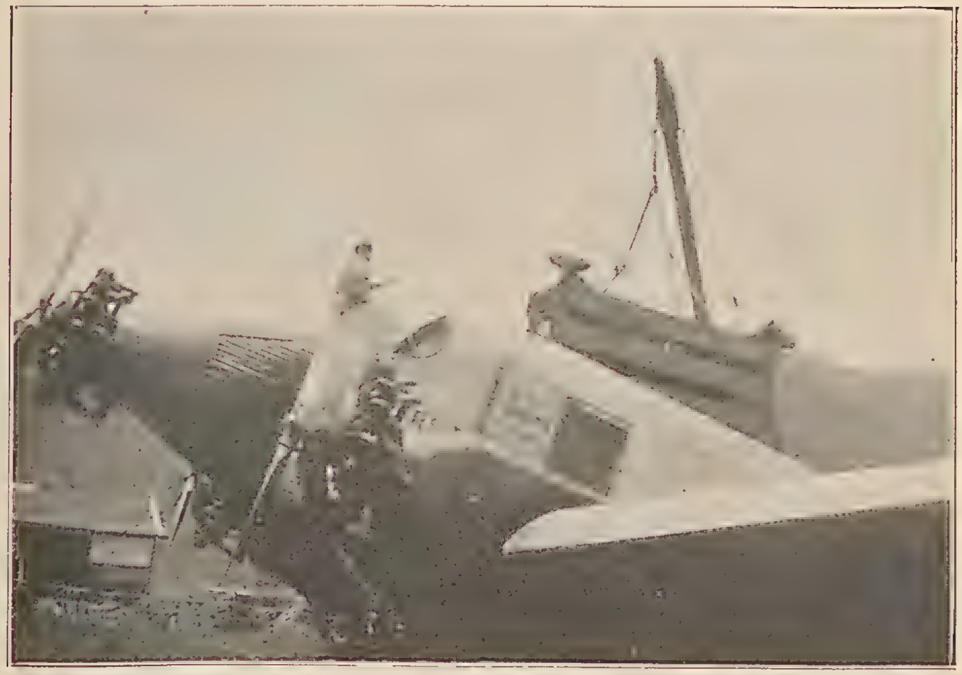

PLATE 13.—THE JUNKER PLANE BECOMES A CATTLE TRANSPORT.

The load was carried on the roof of the plane, and surely no cow has had a more exciting ride, nor a finer view of future mountain pastures.

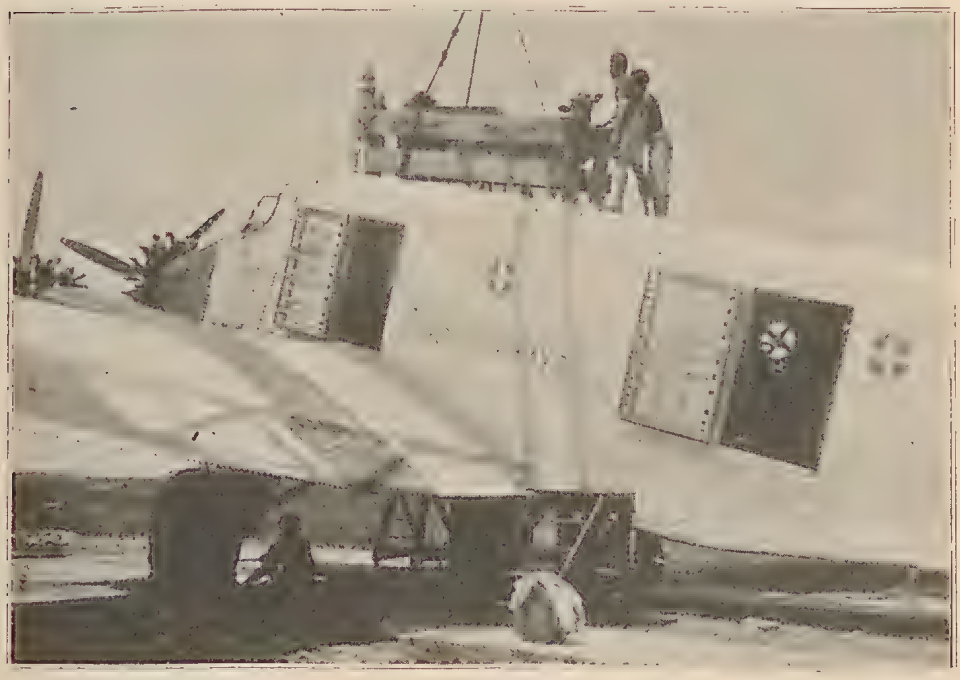

PLATE 14.—CATTLE ARRIVE AT WAU AFTER A FORTY-MINUTE FLIGHT FROM THE COAST.

A previous consignment of cattle from Brisbane was sent to Wau from Salamaua by road with a droving outfit of twenty natives, provisioned for six weeks. The cattle did not survive the rough journey. The aeroplane is now regarded as the quickest, safest, and cheapest means of transport in that part of New Guinea.

## AGRICULTURE ON THE AIR.

### Radio Lectures on Rural Subjects.

ARRANGEMENTS have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 3rd January, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures arranged:—

### SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK. RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 3rd January, 1933—"Diseases of the Passion Vine." J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 5th January, 1933—"The St. Lucia Farm School." Hon. F. W. Bulcock, M.L.A., Secretary for Agriculture and Stock.

Tuesday, 10th January, 1933—"Poultry Culling," J. J. McLachlan, Poultry Inspector.

Thursday, 12th January, 1933—"The Cultivation of Pineapples." H. J. Barnes, Instructor in Fruit Culture.

Tuesday, 17th January, 1933—"Some Lessons from Denmark." J. F. F. Reid, Editor of Publications, Department of Agriculture.

Thursday, 19th January, 1933—"Some Fodder Crops of Central Queensland." W. R. Straughan, Instructor in Agriculture, Rockhampton.

Tuesday, 24th January, 1933—"Potato Cultivation in Central Queensland." C. S. Clydesdale, Senior Instructor in Agriculture, Rockhampton.

Thursday, 26th January, 1933—"Egg Marketing.' P. Rumball, Poultry Expert.

Tuesday, 31st January, 1933—"The Story of Milk," Part I. F. J. Watson, Instructor in Dairying.

Thursday, 2nd February, 1933—"The Story of Milk," Part II. F. J. Watson, Instructor in Dairying.

Tuesday, 7th February, 1933—"Agricultural Correspondence Schools." E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Thursday, 9th February, 1933—"School Pig Clubs." L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 14th February, 1933—"The Cultivation of Tomatoes." H. J. Barnes, Instructor in Fruit Culture.

Tuesday, 16th February, 1933—"Production Recording of Dairy Herds and Its Value to the State." L. Anderson, Senior Herd Tester.

Tuesday, 21st February, 1933—"The Story of the Balance Sheet," Part I. G. B. Gallwey, A.F.I.A., Inspector of Accounts

Thursday, 23rd February, 1933—"The Story of the Balance Sheet," Part II. G. B. Gallwey, A.F.I.A., Inspector of Accounts.

Tuesday, 28th February, 1933—"Butter and Cheese Quality" (Farmer's Share). O. St. John Kent, B.Sc., Analyst.

Thursday, 2nd March, 1933—"Butter and Cheese Quality" (Factory's Share). O. St. John Kent, B.Sc., Analyst.

Tuesday, 7th March, 1933—"The Dairying Industry in Relation to the State's Progress." C. F. McGrath, Supervisor of Dairying.

Thursday, 9th March, 1933—"The Cultivation of Passion Fruit." H. J. Barnes, Instructor in Fruit Culture.

Tuesday, 14th March, 1933—"Sheep Station Management." J. L. Hodge, Instructor in Sheep and Wool.

# The Home and the Garden.

## OUR BABIES.

*Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.*

### BETTY'S TANGLED TROUBLES.

BETTY is a healthy little girl, six years old who should be happy, but is not. The trouble is that she wants to be happy in her own way, which is not a possible way to happiness, yet she persists in it. The most prominent symptom in her behaviour is the trouble she makes about eating. Rarely is she eager for food and almost always she dawdles over her meals. When she eats she keeps a few bolts of food in her cheek and appears agonised at the necessity of swallowing. The worst meal is breakfast, at which Betty can hardly be forced to eat anything. For a long time she has resorted to vomiting, and has had a number of food fads. If she was forced to eat, she would vomit.

What are her reasons for behaving in this way? She has kind and affectionate parents, who are fond of each other, and is an only child. She resents their affection for each other. When the father caresses her mother she protests, saying, "Kiss me, too," or "I want a hug, too." They are poor, and the mother has to go out to work. She resents this, also. She wants her mother always with her, and tries to dominate her, and so to prove her own superiority. She likes being cross to her mother. As her mother attaches much importance to her eating, she uses this to enforce her superiority, for she has found out that by the trick of vomiting she can get the better of her. Both parents are high-strung, and outbursts of nerves have occurred from time to time. This does not help matters. The father's mother has been over-anxious about Betty's food, and constantly discusses it in the child's hearing. Grandmothers with the best intentions sometimes make things worse.

#### An Aggravating Child.

When Betty was first sent to school she revolted violently, crying agonisingly, refusing to eat, and vomiting. This she kept up for three months. Then she suddenly announced that she would go to school without crying. Since then, strange to say, she has become quite a favourite there, for she knows how to ingratiate herself with other children and with her teachers. But she is no better at home, and, indeed by contrast seems worse. Lately, though, she usually sleeps well, she has several times awoke screaming, saying that lions and tigers were coming up the stairs. Thus she has found a new way to irritate and occupy her parents at night. She has also invented a new way to frighten her playmates by saying, "If you don't do such and such I'll send you the influenza to get you to-night. I'll send it through the open window, and you'll die." Finally she has succeeded in frightening herself, and insists on the windows being shut.

It must be admitted that Betty is a very aggravating child. But she is far from stupid; she has formed for herself a pattern of behaviour, which she has carried out with much intelligence and much force of will. She has deep affections, a strong character, and knows how to adapt herself to circumstances. Were her mother to treat her more wisely, to appeal frankly to her intelligence, and to suppress her own emotion, Betty is open to improvement and should grow up a strong woman. After all, she has, like all of us, been searching for happiness, but searching along a wrong road. There is yet hope for Betty, which is fortunate, for there are many Bettys in Queensland.

# Orchard Notes for February.

## THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4¼ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Where there are facilities for cyaniding, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months with regard to handling, grading, packing, and marketing

is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded, and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

# Farm Notes for February.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good ''seed'' and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. ''Irish Blight'' has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other ''hoed'' crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

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## TO NEW SUBSCRIBERS.

**New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.**

**When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.**

**Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.**

**Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.**

## CLIMATOLOGICAL TABLE—NOVEMBER, 1932.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure Mean at 9 a.m. | Shade Temperature. Means. Max. | Means. Min. | Extremes. Max. | Date. | Min. | Date. | Rainfall. Total. | Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| *Coastal.* | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| Cooktown .. .. | 29·93 | 89 | 76 | 90 | 5, 25–27 | 73 | 12, 13, 21, 25, 26 | 93 | 5 |
| Herberton .. .. | .. | 83 | 61 | 90 | 20, 21 | 56 | 12 | 7 | 1 |
| Rockhampton .. .. | 30·00 | 88 | 68 | 93 | 5, 17, 19 21, 22 | 61 | 20 | 431 | 5 |
| Brisbane .. .. | 30·07 | 80 | 64 | 87 | 21 | 59 | 11 | 284 | 9 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. | 30·02 | 84 | 61 | 93 | 22 | 54 | 7 | 376 | 9 |
| Stanthorpe .. .. | .. | 77 | 54 | 89 | 17 | 46 | 28, 29 | 310 | 10 |
| Toowoomba .. .. | .. | 78 | 57 | 87 | 21, 22 | 50 | 2 | 509 | 9 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·86 | 94 | 74 | 102 | 24 | 66 | 12 | 50 | 1 |
| Longreach .. .. | 29·90 | 96 | 69 | 104 | 21, 22 | 63 | 2, 8 | 209 | 6 |
| Mitchell .. .. | 29·97 | 87 | 62 | 101 | 17 | 49 | 2 | 381 | 12 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 29·88 | 94 | 77 | 99 | 22, 25 | 71 | 10 | 9 | 1 |
| Boulia .. .. | 29·89 | 98 | 67 | 109 | 21 | 55 | 2 | 47 | 3 |
| Thargomindah .. .. | 29·94 | 92 | 65 | 103 | 21 | 53 | 1 | 70 | 4 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1932, AND 1931 FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. Nov. | No. of Years' Records. | Total Rainfall. Nov. 1932. | Nov. 1931. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 2·25 | 31 | 0·27 | 6·73 |
| Cairns .. .. | 3·80 | 50 | 1·68 | 4·06 |
| Cardwell .. .. | 4·04 | 60 | 1·75 | 7·06 |
| Cooktown .. .. | 2·59 | 56 | 0·93 | 3·58 |
| Herberton .. .. | 2·54 | 46 | 0·07 | 3·46 |
| Ingham .. .. | 3·62 | 40 | 5·16 | 4·47 |
| Innisfail .. .. | 6·14 | 51 | 1·56 | 14·64 |
| Mossman Mill .. | 4·19 | 19 | 1·73 | 7·23 |
| Townsville .. .. | 1·82 | 61 | 1·98 | 5·48 |
| *Central Coast.* | | | | |
| Ayr .. .. | 1·63 | 45 | 1·48 | 1·73 |
| Bowen .. .. | 1·27 | 61 | 0·13 | 1·56 |
| Charters Towers .. | 1·45 | 50 | 1·32 | 1·50 |
| Mackay .. .. | 3·01 | 61 | 1·39 | 9·08 |
| Proserpine .. .. | 2·71 | 29 | 0·99 | 2·28 |
| St. Lawrence .. | 2·29 | 61 | 0·85 | 6·76 |
| *South Coast.* | | | | |
| Biggenden .. .. | 2·77 | 33 | 1·16 | 4·85 |
| Bundaberg .. .. | 2·48 | 49 | 0·56 | 3·49 |
| Brisbane .. .. | 3·73 | 81 | 2·84 | 8·51 |
| Caboolture .. .. | 3·41 | 45 | 2·44 | 9·40 |
| Childers .. .. | 2·68 | 37 | 1·60 | 3·23 |
| Crohamhurst .. | 4·33 | 39 | 4·64 | 8·77 |
| Esk .. .. | 3·18 | 45 | 3·75 | 4·24 |
| Gayndah .. .. | 2·86 | 61 | 5·31 | 5·88 |
| Gympie .. .. | 3·16 | 62 | 1·74 | 5·14 |
| Kilkivan .. .. | 2·56 | 53 | 1·77 | 3·08 |
| Maryborough .. | 3·13 | 60 | 1·80 | 4·49 |

| Divisions and Stations. | Average Rainfall. Nov. | No. of Years' Records. | Total Rainfall. Nov. 1932. | Nov. 1931 |
|---|---|---|---|---|
| *South Coast—continued—* | In. | | In. | In. |
| Nambour .. .. | 3·79 | 36 | 2·67 | 7·09 |
| Nanango .. .. | 2·62 | 50 | 3·12 | 3·65 |
| Rockhampton .. | 2·23 | 45 | 4·31 | 5·40 |
| Woodford .. .. | 3 21 | 45 | 1·41 | 6·25 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 2·69 | 62 | 3·76 | 4·84 |
| Emu Vale .. .. | 2·66 | 36 | 3·53 | 4·76 |
| Jimbour .. .. | 2·40 | 44 | 3·67 | 3·55 |
| Miles .. .. | 2·48 | 47 | 3·21 | 6·13 |
| Stanthorpe .. | 2·71 | 59 | 3·10 | 4·06 |
| Toowoomba .. | 3·26 | 60 | 5·09 | 7·24 |
| Warwick .. .. | 2·58 | 67 | 5·82 | 4·67 |
| *Maranoa.* | | | | |
| Roma .. .. | 2·07 | 58 | 4·34 | 3·65 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 2·02 | 18 | 4·14 | 3·84 |
| Gatton College .. | 2·73 | 33 | 4·81 | 4·34 |
| Gindie .. .. | 1·97 | 33 | 3·84 | 1·83 |
| Hermitage .. | 2·59 | 26 | 4·39 | 4·43 |
| Kairi .. .. | 2·27 | 18 | .. | 5·13 |
| Mackay Sugar Experiment Station | 2·66 | 35 | 2·02 | 5·67 |

GEORGE E. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

### AT WARWICK.

| | January, 1933. | | February, 1933. | | MOONRISE. Jan., 1933. | MOONRISE. Feb., 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | a.m. | a.m. |
| 1 | 5·3 | 6·47 | 5·28 | 6·42 | 9·37 | 11·15 |
| 2 | 5·4 | 6·47 | 5·29 | 6·42 | 10·33 | 11·56 |
| | | | | | | p.m. |
| 3 | 5·4 | 6·47 | 5·29 | 6·41 | 11·27 | 12·57 |
| | | | | | p.m. | |
| 4 | 5·5 | 6·48 | 5·30 | 6·41 | 12·21 | 1·50 |
| 5 | 5·6 | 6·48 | 5·31 | 6·40 | 1·15 | 2·44 |
| 6 | 5·6 | 6·48 | 5·31 | 6·40 | 2·9 | 3·27 |
| 7 | 5·7 | 6·48 | 5·32 | 6·39 | 3·5 | 4·28 |
| 8 | 5·8 | 6·49 | 5·33 | 6·39 | 4·0 | 5·17 |
| 9 | 5·9 | 6·49 | 5·33 | 6·38 | 4·54 | 6·0 |
| 10 | 5·10 | 6·49 | 5·34 | 6·37 | 5·47 | 6·37 |
| 11 | 5·10 | 6·49 | 5·35 | 6·36 | 6·37 | 7·11 |
| 12 | 5·11 | 6·49 | 5·36 | 6·36 | 7·23 | 7·42 |
| 13 | 5·12 | 6·49 | 5·36 | 6·35 | 8·3 | 8·13 |
| 14 | 5·13 | 6·49 | 5·37 | 6·34 | 8·40 | 8·46 |
| 15 | 5·14 | 6·49 | 5·38 | 6·33 | 9·9 | 9·22 |
| 16 | 5·15 | 6·49 | 5·39 | 6·33 | 9·40 | 10·1 |
| 17 | 5·16 | 6·48 | 5·39 | 6·32 | 10·11 | 10·45 |
| 18 | 5·17 | 6·48 | 5·40 | 6·31 | 10·42 | 11·40 |
| 19 | 5·18 | 6·48 | 5·41 | 6·31 | 11·18 | .. |
| 20 | 5·18 | 6·48 | 5·42 | 6·30 | 12·0 | 12·40 |
| | | | | | a.m. | a.m. |
| 21 | 5·19 | 6·47 | 5·42 | 6·29 | .. | 1·44 |
| 22 | 5·20 | 6·47 | 5·43 | 6·29 | 12·49 | 2·50 |
| 23 | 5·21 | 6·47 | 5·44 | 6·28 | 1·48 | 3·56 |
| 24 | 5·21 | 6·47 | 5·45 | 6·27 | 2·52 | 5·1 |
| 25 | 5·22 | 6·46 | 5·45 | 6·25 | 3·59 | 6·2 |
| 26 | 5·23 | 6·46 | 5·46 | 6·24 | 5·8 | 7·1 |
| 27 | 5·24 | 6·46 | 5·47 | 6·23 | 6·15 | 7·57 |
| 28 | 5·24 | 6·45 | 5·48 | 6·22 | 7·18 | 8·53 |
| 29 | 5·25 | 6·45 | .. | .. | 8·19 | .. |
| 30 | 5·25 | 6·44 | .. | .. | 9·14 | .. |
| 31 | 5·26 | 6·44 | .. | .. | 10·9 | .. |

## Phases of the Moon, Occultations, &c.

| | | | |
|---|---|---|---|
| 4 Jan. | ☾ First Quarter | 2 24 p.m. |
| 12 ,, | ○ Full Moon | 6 36 p.m. |
| 19 ,, | ☽ Last Quarter | 4 15 p.m. |
| 26 ,, | ● New Moon | 9 20 a.m. |

Apogee, 7th January, 11.36 a.m.
Perigee, 23rd January, 12.48 p.m.

January 3rd, Earth in perihelion. The velocity of the Earth will be somewhat greater than its average of 18 and a fraction, which amounts to nearly one-half mile a second.

This will be occasioned by its nearness to the Sun, being 94,330,000 miles instead of 94,450,000, as it was on July 4th.

On the 8th Jupiter will reach a stationary position on the border line of Leo and Virgo, after being, apparently, amongst the stars of Leo for 9 months.

On the 16th at midnight the moon will be passing from west to east of Mars, which will be 5 degrees northward of it. Four hours later the Moon will be passing Jupiter, which will be 3 degrees to the north.

On the 16th at 3 a.m. telescopic observers will find Neptune 1 degree northward of the Moon.

On the 22nd Mars will be stationary near the border line between Leo and Virgo, having been amongst the stars of Leo since October 12th.

On the 27th Saturn will reach that far part of its orbit which brings it in a line with the Sun and the Earth. It will then be nearly 900 million miles distant, which would reduce it to its smallest apparent dimensions, if observable. Saturn is now on the border line between Sagittarius and Capricornus. Since June, 1928, the apparent width of the Ring has been decreasing and, although fairly well observable during 1932, was not quite half as good as in 1928. The apparent width will continue to decrease till June, 1936.

Mercury rises at 3.36 a.m. at Warwick on the 1st and at 3.55 a.m. on the 15th.

Venus rises at 3.11 a.m. on the 1st and at 3.28 a.m. on the 15th.

Mars rises at 10.48 p.m. on the 1st and at 10.0 p.m. on the 15th.

Jupiter rises at 10.57 p.m. on the 1st and at 10.2 p.m. on the 15th.

Saturn sets at 8.31 p.m. on the 1st and at 7.33 p.m. on the 15th.

Venus will be in Orphineus from the 1st to the 9th and in Sagittarius from the 10th to the 31st.

| | | | |
|---|---|---|---|
| 2 Feb. | ☾ First Quarter | 11 16 p.m. |
| 10 ,, | ○ Full Moon | 11 0 p.m. |
| 18 ,, | ☽ Last Quarter | 12 8 a.m. |
| 24 ,, | ● New Moon | 10 44 p.m. |

Apogee, 4th February, at 7.12 a.m.
Perigee, 18th February, at 8.42 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling. Members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

# QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXIX. 1 FEBRUARY, 1933. PART 2.

## Event and Comment.

### Improvement of Dairy Cattle.

SO much interest has been displayed by dairy farmers in the provisions of the Dairy Cattle Improvement Act that the remarks of the Minister for Agriculture and Stock (Hon. Frank W. Bulcock), when introducing his measure, are just now of especial concern. Mr. Bulcock said:—

> For very many years there has been a definite opinion in our community that something more than is being done should be done to improve the standard of dairy cattle in the State. When we contrast what is being done in the other States with what is being done in Queensland, even allowing for the varying conditions, it must be obvious that there is scope for some activities that we have not engaged upon up to the present. These activities concern production, yield, and also the health of our dairy stock. It would be futile to suppose that we have reached the highest point of production. We have very definite indications in other countries and in other States of the capacity of the dairying industry to respond to a well-organised system of herd-testing, side by side with a survey of the diseases existent in the herds of the State.
>
> This is a simple Bill containing provisions that are incorporated in the dairy legislation of several other States in the Commonwealth. It provides for the establishment of a fund which will be materially under the dominance and guidance of representatives of the industry for the purpose of embarking upon a very definite production and disease survey of the herds of our State. On two occasions I have met the representatives of the dairying industry, and, after having discussed all phases of the question with them, the scheme which is embodied in this Bill has received their blessing. So late as Saturday last (26th November—Ed.) a conference was held at Gatton College, and the dairymen assembled there approved of the scheme.
>
> It must be apparent to everybody that there are two outstanding factors that require consideration in our dairy life. One is the quality of bulls; the other is the ramifications of disease in our herds. While we have given a good deal of care and attention to the cow, we have not given the same care and attention to the bull; and, while there have been many zealous citizens in the State who have given valuable assistance to the dairying industry, any unbiassed observer must be forced to the conclusion that some further effort is needed.

As I personally visualise this question, I see it in this perspective: We have an extraneous aid in the existing rate of exchange; but that is not always going to help us. We have certain other things in our dairying industry that act as a very substantial prop to the industry; but we cannot be blind to the fact that these aids may disappear at some date; and, if they should disappear, then we must make up for their loss by additional production; and now is the time to embark on that. Anybody who has given consideration to the disease side of the question knows that the spread of certain diseases is assuming alarming proportions in the dairy herds of the State. Because of that, it is necessary that we embark on some comprehensive scheme to achieve the desired objective.

I am not going to argue that this is an ambitious scheme. It is a modest scheme, and a modest beginning. It means, in effect, that we shall lay the foundations of a scheme whereby the State and the individual concerned will gain a good deal of benefit. It is obviously impossible to put it into operation forthwith. It is a scheme which essentially must be extended over a number of years; and that extension will yield very rapid results in the years that are to come. It is estimated that from a license fee of 5s. per bull we shall receive about £5,000 per annum, all of which will be applied in the direction of creating a board for the improvement of the dairying industry.

The dairy factories have agreed, in the main, to co-operate with this scheme; and I have assurances from quite a number of them that they are prepared to do all they can in the direction of extending the system of herd-testing. Obviously the officers employed by my department will be used in conjunction with this scheme. It is not proposed to add materially to that side of the subject; but it is proposed to appoint one or more veterinary officers for the purpose of embarking on any disease survey which is so necessary.

These are substantially the contents of the Bill. I believe that it marks the beginning of that comprehensive survey which is so necessary for our dairy herds.

## Some Lessons from Denmark.

At a ward conference of Local Producers' Associations at Gatton recently, it was suggested that some valuable lessons in rural organisation and scientific research could be learned from Denmark by Queensland farmers. There is no doubt that interesting little country can give the world some excellent lessons in rural education and organisation, but distant hills always look green, and, as a party of British farmers found out while on a mission of inquiry to that country some little time ago, Denmark cannot be regarded altogether as an agricultural Utopia.

Its soil, its climate, and even its markets are in no way exceptionally favourable to the farmer. As in Queensland, the year's returns are influenced greatly by economic conditions. One must not regard Danish agriculture as being invariably and necessarily very profitable, neither need one run away with the idea, so widely held, that the technical skill and organising abilities characteristic of the Danes secure for them immunity from the effects of adverse economic circumstances.

Denmark is a very small country, hardly bigger in area than a North Australian cattle station—something between 16,000 and 17,000 square miles. It is in the same latitude as the country situated between Newcastle in England and Inverness in Scotland, but its winter is colder and its spring later than in the corresponding parts of Britain, where the climate is tempered by the influence of the Gulf Stream.

An important factor in the development of agriculture in Denmark is the ownership of the land by the individual farmer—a system of peasant proprietorship that has proved so highly successful. This fact, probably more than anything else, has contributed to the high standard of Danish farming, and is to a large degree responsible for the success in the establishment of co-operative concerns.

It is an interesting historical fact that the movement for acknowledgment of the principle of ownership of the land by the man who uses it started in Denmark many years before it was even thought of in other countries. This movement has been developed gradually, until a few years ago compulsory legislation was passed for the cutting up of big estates in order that the rising generation should have a chance of securing land for farming in their own country. From that fact, it is quite obvious that Danish farmers have a big say in the Government of their country, a possibility laughed to scorn a generation or two ago when the suggestion that a farmer could be a member of Parliament was regarded as a stock joke.

It is also a little known fact that Denmark was the first European country to get a free constitution, with every man having the right to a vote. That measure of democracy was accomplished without revolution or bloodshed, and came as a natural consequence of an excellent education system that had been in force since

1814. The present sound position, comparatively, of the Danish farmer is due largely to the educational advantages he possesses, and through which he has been able to develop a high standard of leadership in all his co-operative enterprises.

In modelling their school system, both in respect to juvenile and adult scholars, the Danes have evidently observed the dangers of a narrow technical training. They have apparently discovered that real technical education is as much a matter of mental and spiritual development as anything else. They seemingly believe that technical education involves much more than just shaping material in a workshop, that a training along lines leading only to profit-making ends cannot produce the highest results, either in the education of the rank and file or in the education of their leaders. The result is that in their co-operative and legislative undertakings trained minds and developed thought are brought to bear, and in their public life, be it merely local or national, there is no lack of well-informed and genuinely patriotic leadership.

The practical efficiency of the Danish farmer is, however, mainly due to a fairly long apprenticeship on a good farm followed by a term in an Agricultural School. The school gives a general training in agriculture to young men who have already had three or four years field experience on a farm and have also attended the cultural courses at the People's High Schools. It is in these schools that dairy supervisors, cream testers, and assistants in local co-operative undertakings are trained. At the apex of the whole scheme is the College of Agriculture at Copenhagen, an institution of the same standing as a University. This college is remarkably well equipped, and has a staff of about fifty professors. It offers advanced courses in Agriculture, Veterinary Science, and all the allied branches of rural industry to students who have passed through the recognised general educational courses, and have had at least two years' experience on a farm.

The college has been fortunate in the men, who, from time to time, have held the chairs in the several faculties and some of them have won a world-wide reputation. Complete confidence of the farmers in the college is enjoyed, and that confidence has never been lost, and to-day the co-operation between the University and the farm in Denmark is complete, natural, and mutually loyal.

By its publications, by its research work at experiment stations, by its educational tours, by its output of trained agricultural scientists and economists the College of Agriculture in Copenhagen is the centre of effort and attainment, from which radiates the force that in the world of agriculture has made the name of Denmark great. Of course, the law of averages operates in Denmark the same as elsewhere, and this is so in respect to the personal equation—the human element. It would be wrong, however, to think of Danish farmers as all highly trained specialists in agricultural science; but to a good elementary schooling they have added a sound practical apprenticeship, on which again has been imposed the stimulation to industry and cultural thought gained from the courses in the People's High School and Agricultural School.

Their co-operative societies keep them well up in the collar by applying pressure on them to adopt improved methods and to observe most scrupulously the rules prescribed in the interests of all engaged in the industry.

The inspiration and direction towards scientific farming and efficient business methods come from the technical advisors appointed by the co-operative societies and the State, the scientists engaged in research work, the professors of the Agricultural College, and very capable and highly trained business men who control the co-operative export associations and other branches of the commercial side of rural industry.

Like farmers the world over, the Dane has little scope for reducing the costs of production, but he has eliminated waste wherever possible and tuned up the efficiency of his system and, in dairying particularly, the capacity of his cows.

The chief lessons, then, that we may learn from Denmark are contained in these salient points:—Danish farmers work, not as isolated units, but as members of big highly co-ordinated industry. Intensive methods of cultivation and selection of crops on a nationally accepted plan. Stock breeding and stock feeding on lines scientifically proved to be the most profitable. Supervisory work designed to help any backward farmers and keep them familiar, on their own holdings, with technical progress. Encouragement of and insistence upon a uniformly high standard of dairy and other produce. Generous credits and technical direction for new settlers—an extension of co-operative marketing. Labour-saving mechanical equipment.

Whether these points are practicable in Queensland or not, it must be admitted that there is something very impressive in the example of a country which calls science to its aid from the growing of the very grass that feeds the cow to the manufacture and packing of butter for export.

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

### THE GREYBACK CANE BEETLE.

By EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—Editor.

### FEBRUARY.

1. End of egg and beetle periods of the greyback cockchafer.
2. Infestation of cane land by first and second stage grubs.

THE beetle and egg phases in the life cycle of our "greyback" cockchafer have now been completed, and during the present month its destructive grubs will dominate the field of activity. Although a few first-stage larvæ can still be found, the majority of grubs will either enter upon or complete the course of their second instar of growth, while about the end of February a small percentage of these may be expected to moult into the third stage, thereby assuming the voracious well-known form in which, during the next three months (March to May), they are known to cause wilting of the leaves or death of the infested cane stools.

The grub and its varied subterranean movements may lay claim, therefore, to our chief consideration during the month of February; its habits, structure, control, mode of injury to cane, and inter-relationships with both parasitic and predaceous insect enemies, presenting a wide and most interesting field for future scientific research.

The silent, though sinister, underground activities of this pest, although hidden from observation, should not be deemed less menacing on that account. Coming events have already cast their shadows before, but it is feared that many growers who, during the flighting season of the beetles, were unpleasantly reminded of what might befall their crops later on, are, nevertheless, too apt—while surveying their apparently flourishing cane during February—to ignore such warnings, and become unduly optimistic as to future harvesting results.

It should be borne in mind that even greyback grubs of the second instar of development when little more than an inch long are able at times to seriously injure young plant cane. On blocks, for instance, where early infestation chances to average twelve to fifteen such grubs per stool, the crop is sometimes fairly eaten out of the ground and totally ruined.

#### The Second Stage Grub.

External evidence of root damage caused by these grubs in February is not as a rule very noticeable during seasons of ordinary beetle infestation. Although acting the part of a good second, the most aggressive capabilities of second-stage grubs attain maximum force when united with those of grubs commencing the third instar of growth, which generally happens about the middle of March.

#### Habits and Movements of the Grubs.

Unfortunately the nature of damage to cane from larvæ of this cockchafer is too well known to need more than brief comment. After wet weather, small first-stage grubs will often move upwards to within about 4 in. from the surface to feed upon succulent young upper roots; and during the following fortnight or three

weeks, while increasing slowly in size, sometimes penetrate to a depth of 6 or 7 in., and after moulting into the second instar start to feed more voraciously upon larger roots.

Ultimately, when entering upon the third stage of development (which often occurs about the end of February), they are usually found feeding in company with grubs of the second stage; turning their attention, however, to the large cord-like cane roots, the function of which is to furnish a constant supply of water to the sticks and leaves, while serving also to anchor and maintain the stools in rigid upright position.

During February, however, greyback grubs of the second stage may be said to predominate, and have now attained sufficient size to attract notice from cane farmers and cause more or less anxiety.

## Shape and Colour of Grub.

The familiar doubled up appearance of grubs of the greyback (a form common to that of most scarabæid beetles) remains practically the same throughout the long period passed in its larval condition. During the course of the second instar of growth, the head, as before pointed out ("Queensland Agricultural Journal," vol. xxxviii., p. 6), is always a quarter of an inch wide, the general colour of the body being creamy white, but somewhat bluish and translucent just after moulting. The large anal or last body segment is plainly suffused with dark grey, blue, or brown, due to the internal presence and varying colour of the kind of soil being ingested by the grub showing through its thin semi-transparent skin. On the lower surface of this terminal segment are two parallel rows of short, reddish spine-like hairs, about twenty-four in each row, surrounded on either side by numerous longer scattered bristles (see illustration). This curious arrangement of hairs, which is invariably present on first, second, and third stage larvæ, affords an easy and certain way of distinguishing grubs of our greyback from those of other closely related cane beetles.

## How to Destroy Cane Grubs.

Combating the notorious cane beetle during its larval condition has been found to yield best results, since this life cycle stage occupies a period of about five months of the year. Recent successes achieved against its grubs by the practice of soil fumigation have definitely established this control measure on a firm basis; the practical value of both carbon bisulphide and paradichlorobenzene having been demonstrated by field experiments carried out at the Greenhills estate and by many of our growers in the Northern districts. In view of the fact that secondary emergences have occurred this season in certain localities about the middle of December last, and fumigation work is likely to start in these areas about the end of February, it becomes advisable to briefly describe the method usually adopted when injecting soil fumigants. Before doing so, however, the table below giving correct dates on which to start such work should be consulted, bearing in mind that the periods shown thereon (from date of commencement of flighting season to that of injection of the cane) apply to the last emergence of cane beetles noticed by the farmer concerned.

When to Fumigate Grub-infested Cane Land.

| Beetles Emerge. | Time to Fumigate. | Beetles Emerge. | Time to Fumigate. | Beetles Emerge. | Time to Fumigate. |
|---|---|---|---|---|---|
| Nov. 18 | Jan. 27 | Dec. 3 | Feb. 11 | Dec. 18 | Feb. 26 |
| Nov. 19 | Jan. 28 | Dec. 4 | Feb. 12 | Dec. 19 | Feb. 27 |
| Nov. 20 | Jan. 29 | Dec. 5 | Feb. 13 | Dec. 20 | Feb. 28 |
| Nov. 21 | Jan. 30 | Dec. 6 | Feb. 14 | Dec. 21 | Mar. 1 |
| Nov. 22 | Jan. 31 | Dec. 7 | Feb. 15 | Dec. 22 | Mar. 2 |
| Nov. 23 | Feb. 1 | Dec. 8 | Feb. 16 | Dec. 23 | Mar. 3 |
| Nov. 24 | Feb. 2 | Dec. 9 | Feb. 17 | Dec. 24 | Mar. 4 |
| Nov. 25 | Feb. 3 | Dec. 10 | Feb. 18 | Dec. 25 | Mar. 5 |
| Nov. 26 | Feb. 4 | Dec. 11 | Feb. 19 | Dec. 26 | Mar. 6 |
| Nov. 27 | Feb. 5 | Dec. 12 | Feb. 20 | Dec. 27 | Mar. 7 |
| Nov. 28 | Feb. 6 | Dec. 13 | Feb. 21 | Dec. 28 | Mar. 8 |
| Nov. 29 | Feb. 7 | Dec. 14 | Feb. 22 | Dec. 29 | Mar. 9 |
| Nov. 30 | Feb. 8 | Dec. 15 | Feb. 23 | Dec. 30 | Mar. 10 |
| Dec. 1 | Feb. 9 | Dec. 16 | Feb. 24 | Dec. 31 | Mar. 11 |
| Dec. 2 | Feb. 10 | Dec. 17 | Feb. 25 | Jan. 1 | Mar. 12 |

**Determining Degree of Grub Infestation.**

Commence your examination in the middle of any block of cane thought likely to be grub infested by removing the soil from around the base of a stool. Should grubs occur amongst the side roots in numbers of four to eight or more, such stools need not be dug out. After recording the results obtained, a second stool, about a chain further on in the same row, should be treated in similar manner, and followed up by successive examinations of others in the same row at intervals of 66 ft. apart. Every fourteenth row in the block to right and left of the one examined should then receive similar inspection. If obtaining an average of three or more grubs per stool the area should be fumigated.


PLATE 15.

Activities of the Second-stage Grubs of our "Greyback" Cockchafer Beetle during February.

In years when the final emergence of beetles chances to take place about the middle of December, scouting is usually commenced a couple of months later.

### How to Use the Hand-Injector.

Before fumigating be sure to see that the soil is in a favourable state at the time of application, in order that the volatile fumes may be able to permeate freely between the tiny soil particles. In other words, it must on no account be water-logged or in a semi-saturated condition, such as often prevails for a day or so following a heavy downpour. The land must not be too dry or too wet, but in a state in which it could, if desired, be cultivated with the best results. Naturally, well-drained lands of a light nature attain this desirable state of aeration in two or three days, while clay-loams might take four days, or even longer in the case of poorly drained low-lying areas.

PLATE 16.
Typical Shape of Grub of Greyback Cane-Beetle.

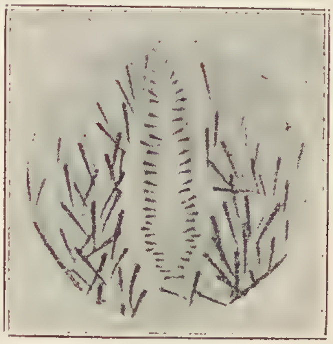

PLATE 17.
Arrangement of the Central Bristles on Anal Segment of Grub.

Familiarity with the construction of the hand-injector will be found helpful when something happens to go wrong with the mechanism; in such cases, however, advice can always be obtained from the Cane Inspector, or the Entomologist.

Before starting, see that the foot-rest on injector is in correct position for administration of the fumigant just above the level at which grubs chance to be feeding at the time. The usual dosage for carbon bisulphide is $\frac{1}{6}$th oz., equivalent to about $4\frac{1}{2}$ cc.; a similar dosage being the 1 drachm 20 minims, which represents about 4 cc., and is the quantity discharged by Danks injector when set at No. 5.

Injections are made about 1 ft. apart on both sides of a cane row, 3 in. from stools and 4 to $4\frac{1}{2}$ in. deep. The number of stabs given will depend to some extent on the age of the crop being treated, on the size of the stools, and existing soil porosity. In some instances, it has been found advisable to give five or even six injections to certain large stools in order to ensure best results.

If mixing paradichlorobenzene with carbon bisulphide 60 lb. of the former are generally dissolved in about 5 gallons of the liquid carrier. This should be stirred well, and when completely dissolved filtered through copper gauze before pouring into the injector. During the course of fumigation examine a few of the treated stools at intervals of a day or so to note nature of results. Test the pumps above ground occasionally to make sure the dose is being discharged in uniform and correct quantity, and at each stroke of the plunger.

Fuller information regarding hand-injectors, &c., will be given later on, at the time of year when orders for same, together with amounts of fumigants required by individual growers, are usually placed with the managers of our various sugar-mills.

The February plate shows the commencement of damage of a material nature to roots of sugar-cane by second-stage grubs of the "greyback" cockchafer; external indications of which, however, are not usually apparent until next month.

# Farm Fertility Trials

and

## REVIEW OF THE WORK OF EXPERIMENT STATIONS.

### RESULTS FOR THE 1932 SEASON.

*In presenting the results of the Farm Fertility Trials harvested during 1932, advantage is taken of the opportunity to review also the work of the past year on the Northern, Central, and Southern Experiment Stations. The results of plot experiments harvested on these Stations have already been recorded in the Annual Report of the Director, but as certain of them are of special interest, a detailed discussion of their more valuable features is again presented. Attention is directed particularly to those trials which aimed at determining the manurial value of molasses, and the possibilities of irrigation in those areas which are at present dependent on natural rainfall.*

## EXPERIMENT STATION RESULTS.

THE work of the Stations during the past year has provided us with some valuable and interesting results. This is particularly true of the trials harvested at South Johnstone.

### Fertilizer Trials.

At that Station the recent results confirm our previous conclusions regarding the differential response to the three plant foods applied—Nitrogen (N), phosphoric acid (P), and potash (K), and have also provided further information regarding the amount of fertilizer per acre which may be applied profitably. We may summarise these results as follows:—

Plant crops show consistently good response to superphosphate applied in the drill with the cane plants. The response to potash on this soil is very slight, although a small amount added with the superphosphate does appear to have a definite influence on the c.c.s. of the cane. At the present juncture it appears that potash is instrumental in hastening maturity, even on soils of this nature which are fairly well supplied with this plant food in an available condition. This is an important point, which should be clearly appreciated by those growers who are in the habit of using "straight" superphosphate and dispensing with potash for both plant and ratoon crops, and it is of special significance in the case of cane crops which will be harvested early in the season.

As regards nitrogen, it has been demonstrated repeatedly that little increase in crop yield is experienced by the use of sulphate of ammonia on plant cane, provided a heavy leguminous crop has been ploughed under prior to planting. Where the land has been bare-fallowed this does not hold, and it is imperative that nitrogenous fertilizer be applied for maximum returns under these conditions.

For ratoons, the situation is rather similar to that observed with plant cane. The pronounced response to superphosphate is again recorded, while potash is also important only in its influence on maturity of the crop. With respect to nitrogen, the position demands special attention, for the response to this plant food is particularly marked. Even where green manuring has been practised, the influence of the bean crop has practically disappeared by ratooning time, and the use of sulphate of ammonia is essential for heavy crops. With second and subsequent ratoons the need for sulphate of ammonia becomes even more acute, and any deficiency in the supply of this material is accompanied by a serious reduction in crop yield.

With respect to the maximum economic application of fertilizer under these conditions, our data are as yet incomplete. The heaviest application of superphosphate at South Johnstone during the past season was 900 lb. per acre, and the fact that this dressing showed an increased yield of 3¾ tons of cane over that following a 600 lb. application, indicates that the heavier dressing may be given to advantage. So far we have failed to obtain any marked improvement from applications in excess of 100 lb. per acre of muriate of potash, even where heavy treatments with nitrogen and phosphates were applied. To date, the heaviest application of sulphate of ammonia has been 400 lb. per acre, and this dressing indicated clearly that increased applications of this material might well be applied to ratoons.

Bearing in mind that we are dealing *exclusively* with the acid alluvial loams of the Babinda-Innisfail-Tully areas, the following may be taken tentatively, as general fertilizer recommendations for soils of this type:—

*Plant Cane.*

(1) Drill Application.—500 lb. superphosphate and 100 lb. potash per acre.

(2) Top Dressing.—Following a heavy green manure crop, no further nitrogen need be applied. Where bare-fallowing is practised, 200 to 300 lb. per acre of sulphate of ammonia should be given; with a poor green manure crop 150 to 200 lb. per acre will show a profitable return.

*Ratoon Cane.*

(1) Ratooning Mixture.—100 lb. sulphate of ammonia, 500 lb. superphosphate, and 100 lb. potash per acre, applied in a furrow alongside the row of stools at ratooning time.

(2) Top Dressing.—On all blocks, from 400 to 600 lb. per acre of sulphate of ammonia should be applied. This should be given in two or three dressings, at three to four-week intervals.

## Liming.

The profitable and marked increase in crop yield following the use of lime on these soils, suggests that 1 ton of burnt lime or 2 tons of crushed limestone (or earth lime) should be applied per acre, every time the land is in fallow. If in doubt regarding the need for lime, a soil sample should be forwarded to the Brisbane or South Johnstone laboratory, when definite advice will be given.

### Value of Irrigation.

A small scale trial was carried out at South Johnstone to determine the maximum crop yield under conditions as nearly as possible ideal for cane growth. The results of this experiment were recorded in the January (1933) number of the "Queensland Agricultural Journal," to which growers should refer for full details. It should be clearly understood that the phenomenal crop yield obtained in this trial—144 tons of cane per acre—could not be realised under farm conditions; but there are many valuable deductions to be drawn from the investigation. The most important point is, that under the growing conditions normally experienced in our wettest districts, the crop suffers very appreciably from the dry conditions which occur between rainy spells; and the judicious application of irrigation water to maintain continuous growth is responsible for a very pronounced increase in cane yield. It appeared that December, with its long, hot days, was the month during which cane was produced at its maximum rate, but of course the crop could only take advantage of these conditions if it had reached its peak of leaf development and had commenced to make cane.

The marked superiority of April-planted cane over that planted in August was outstanding, and the reduction in crop yield due to the later planting leaves no doubt as to the advantages presented by the former practice. An interesting sidelight, which should appeal to growers in those localities where Top Rot incidence is acute, is the experience that the autumn-planted cane was not attacked, while the adjacent spring-plant was seriously injured. This is in complete confirmation of the advice of our Pathologists that, where possible, autumn planting offers one of the best means of control for this disease.

The whole of the evidence which this small trial presents is strongly in favour of the development of irrigation wherever facilities exist; and this is true for both the humid tropical areas and for the drier Central and Southern districts of uncertain rainfall. In these times of reduced crop values, the exploration of every avenue whereby costs of production may be reduced must be carefully considered, and it is felt that means for improving the supply of soil moisture offer the best prospects in this respect.

### Varietal Trial.

The first competitive trial of Badila against P.O.J. 2878 ("Wonder Cane") was harvested during the past season. Present indications are that, though this variety may have a definite value on the poorer soils of the North, it possesses certain features which suggest that on first-class land, Badila is the superior cane. One objection which should be emphasised is the decided susceptibility of P.O.J. 2878 to Top Rot disease. In the trial blocks under discussion, the cane was seriously infected with this disease, and a heavy percentage of dead shoots was recorded. The Badila was also moderately damaged. The cane out-yielded Badila, however, but the sugar content was decidedly inferior. The following is a summary of the returns:—

| Variety. | Tons Cane Per Acre. | C.C.S. Per Cent. | Tons C.C.S. Per Acre. |
|---|---|---|---|
| Badila .. .. .. .. .. .. | 34·2 | 15·85 | 5·44 |
| P.O.J. 2878 .. .. .. .. .. .. | 39·9 | 14·0 | 5·60 |

A further trial with these varieties was planted during 1932, and the supplies of this cane which will be available in all areas this year, will afford an early opportunity of gauging the true worth of the "Wonder Cane" under the wide range of Queensland conditions.

### Molasses as a Fertilizer.

Two years ago we presented the results obtained from the Bundaberg Station, following an application of molasses at the rate of 10 tons per acre on the red volcanic soil. The crop returns were as follows:—

| Treatment. | Tons Cane per Acre. | |
|---|---|---|
| | Plant Crop. | 1st Ratoon Crop. |
| No treatment | 22·7 | 15·7 |
| 10 tons molasses per acre | 37·1 | 33·2 |

The total increase for the two crops was practically 32 tons of cane per acre, which demonstrates very clearly the definite manurial value of this by-product.

It is well known that the red volcanic soils of this State respond freely to heavy applications of potash-rich fertilizer; and as the chief manurial constituent of molasses is potash, it was thought that our alluvial soils might not show such flattering returns. An attempt was made to verify these suggestions during the past year. Trials were set out both at South Johnstone and at Mackay, and in each case molasses was applied at the rate of 10 tons per acre. A further comparative treatment was introduced by applying the same quantity of plant food in the form of common fertilizer constituents—sulphate of ammonia, superphosphate, and sulphate of potash. The object of this treatment was to determine whether molasses possessed any further virtues which contributed to the increased crop yields. The following are the results for the plant crops:—

| Station. | No Treatment. | 10 Tons Molasses per Acre. | Plant Food Equivalent to 10 Tons Molasses. |
|---|---|---|---|
| | Tons. | Tons. | Tons. |
| Mackay | 17·7 | 23·7 | 25·6 |
| South Johnstone | 28·4 | 41·3 | 38·3 |

The results demonstrate conclusively that molasses is of value as a manure on a wide range of soils. On the South Johnstone alluvial, an increased yield of 13 tons per acre was recorded, and with an indifferent season at Mackay the yield was improved to the extent of 6 tons of cane per acre. The comparison with the fertilizer treatment is indefinite, and the ratoon crop results will be looked for with interest.

There can be no question that the application of molasses to the soil is the best available method of disposing of our surplus production of this by-product. Certainly the material has a definite fuel value, and though the furnace ash obtained in this way contains much of the

phosphate and potash derived from the molasses, the valuable nitrogen is entirely lost, and the average content of this plant food confers upon the molasses a manurial value of about 10s. per ton. With the improved methods of transportation and spreading of the material on the field, it is anticipated that in the very near future the demand for this by-product will far exceed the supply. The results obtained from our experiments would certainly justify such a conclusion.

### Central and Southern Stations.

It is regretted that the results from field trials at Mackay and Bundaberg during the past year have been disappointing. At Mackay, the unfavourable season, coupled with a heavy infestation of Pentodon beetles, nullified most of our efforts; while at Bundaberg all crops were practically a complete failure due to the unprecedented drought conditions which prevailed throughout the year.

## FARM FERTILITY EXPERIMENTS.

The trials harvested during 1932 provide the third series since the inauguration of the farm plot scheme. A continuation of favourable conditions in the Far North enabled us to secure further valuable data; our knowledge of the general needs of the main soil types of those parts is now fairly definite, and we are able to offer advice regarding fertilizer treatments with a high degree of confidence. It was pointed out in earlier discussions of this work that our first aim was to determine the relative importance of the three plant foods—Nitrogen (N), phosphoric acid (P), and potash (K) on the major soil types. The early trials might then be called *qualitative* experiments. Having determined the relative need for these constituents we must consider the amount of each which may be applied profitably. This leads to the so-called *quantitative* trials, two of which were harvested in the Northern districts last year. In the future, the bulk of the trials will be of this nature.

The results from the Mackay area were again disappointing, due in a large measure to the unfavourable season experienced. This is not preferred as an excuse for the failure of the applied fertilizer to show conclusive results. Unquestionably, good and bad years must be considered in evolving an economic manuring programme; but the seasonal conditions of the past three years have been so adverse that many of the trials set out have failed to show payable results, and the grower is susceptible to the deduction that fertilizing is not necessary. This reasoning is, of course, quite incorrect. The fact is, that under the conditions of the experiment inadequate soil moisture is the most serious factor limiting crop production; as a consequence, it frequently happens that the available plant food supply of the soil is sufficient for the modest needs of the small crop, and the added manure has but slight influence. The ratoons during a poor season, following a light plant crop of the previous adverse year, are practically devoid of vitality, and the crop is frequently a failure.

It is important that these facts be kept clearly in mind, for our knowledge of the old lands of this area tells us that they are essentially very poorly supplied with the necessary plant foods, and even the light crops which are harvested will still further deplete the supply, if fertilizers are not applied. At the same time, the financial difficulties frequently involved under these conditions are definitely appreciated; but there is no side-stepping the fact that these lands cannot continue

to remain under cane unless careful attention is paid to the maintenance of soil fertility. The obvious solution to the problem is the provision of an adequate water supply to the crop, to enable it to maintain steady growth through dry seasons, when the benefits of manurial applications would be outstanding.

Similar remarks apply to many of the lands of the Bundaberg area. The drought conditions experienced there during 1932 were such as to render all trials worthless and none were harvested as a consequence.

## GENERAL DEDUCTIONS FROM FARM PLOT RESULTS.

### (1) *Northern Districts.*

For those areas where our results have been adequately substantiated, we are now in a position to offer tentative suggestions regarding suitable fertilizer treatments. These are purely of a general nature, but should serve to indicate whether growers farming the respective soil types are employing fertilizer mixtures which conform with the demands of the soil, as demonstrated by our field experiments.

Under the discussion of Experiment Station results, definite recommendations were laid down for the *acid alluvial* soils of the Far North. These constitute some of the most productive lands of those areas, but heavy fertilization is essential to high crop yields and the maintenance of fertility.

The *red volcanic* lands which occur in these parts are characterised by a marked deficiency in their supply of available potash. This fact has been amply demonstrated by results recorded both here and in previous bulletins. During the past season, a quantitative potash trial was harvested from the farm of Mr. H. J. Thomas, Bartle Frere, the results of which will be found on page 74. The yields indicate that up to 400 lb. per acre of muriate of potash may be applied with profitable results. This is of interest in connection with so-called potash-rich fertilizer used by growers on this soil type. Even employing a mixture with 12 per cent. potash, it would be necessary to apply practically 1,600 lb. per acre to provide potash equivalent to the above. A suitable drill or ratoon mixture for these conditions is 300 lb. meatworks and 300 lb. muriate of potash per acre; or, alternatively, a mixture of similar proportions of potash and superphosphate. The latter mixture would not carry or store well, but would be quite satisfactory if prepared immediately before use.

These soils will also require subsequent top dressings of sulphate of ammonia as was emphasised when discussing the alluvial soils; that is, from 100 to 400 lb. per acre for plant and ratoons, applying particularly heavy dressings to old ratoons.

In passing, it might be mentioned that we have very definite indications that adequate potash dressings will result in improved c.c.s. returns from crops grown on these red volcanic loams. This is of special interest, for crops from these lands show consistently low sugar content. The problem will be studied more intensively during the coming season, when it is hoped that conclusive evidence will be forthcoming.

The *red and brown schist* soils are the third important series in the Northern areas, and these do not present the same consistent results which characterise our trials on the types already discussed. Sometimes

we find pronounced response to phosphate, while again potash is more seriously lacking. Until definite conclusions can be drawn, it is suggested that in general, the following mixture may be employed as a drill or ratoon application:—300 lb. superphosphate and 150 lb. muriate of potash per acre. Again subsequent top dressings with sulphate of ammonia are needed, and we have recorded several instances where in the absence of nitrogenous manures, ratoon crops have been practically failures. Evidence of the value of added nitrogen is presented in the summary of results found on pages 72 and 73. These returns suggest that 400 lb. per acre of sulphate of ammonia would be a satisfactory top dressing for ratoons. This would, of course, be spread in two applications at four to six week intervals.

The fourth important soil type of the Northern districts is the *gravelly loam* of the Tully-Babinda areas. These soils must be regarded as decidedly deficient in plant-food content; yet it is found that where the soil is properly treated, it is capable of yielding 45-ton ratoon crops of Badila. In Tully, it has been the practice to fertilize these lands almost from the first crop, and the wisdom of the policy is clearly evident. It is obvious that this soil type is practically devoid of humus, and, therefore, of the essential plant-food nitrogen. This is borne out by the outstanding response to applications of this plant food. Of the fields so far submitted to plot trial, none is more than a few years old, and in every instance the land has just been brought under the plough. This probably explains the fact that phosphates and potash produce but slight influence on the cane yields as yet; but it is certain that these foods will shortly enter as limiting factors; and growers are advised to forestall the problem by the consistent use of adequate mixed fertilizer. The following drill or ratoon dressing may be taken as suitable:—400 lb. superphosphate and 100 lb. muriate of potash per acre.

As regards the weight per acre of sulphate of ammonia, which should be applied for maximum economic yields, the results from the plot on Messrs. Spencer Brothers' farm (see page 78) should be examined. They show that an application of 400 lb. of sulphate of ammonia increased the yield by 2·66 tons of cane per acre over that from the 200-lb. dressing; and when it is remembered that this particular block is but little removed from the virgin state, 400 to 500 lb. per acre of this fertilizer might be regarded as a reasonable dressing for ratoon crops on soils of this type. For the plant, from 200 to 400 lb. are recommended, if green manuring has not been practised. Where beans or peas have been ploughed under, this dressing would be reduced accordingly.

(2) *Burdekin Area.*

The results of trials harvested in this area during the past year confirm our previous conclusions. The increased returns from sulphate of ammonia have been outstanding, and it is now conceded by experienced growers that the use of nitrogenous manures has done much towards solving the ratooning problems in that area. We are unable to base recommendations for mixed fertilizer on the results of our field trials to date, but it is suggested that a balanced mixture of phosphate and potash, applied at the rate of 300 to 400 lb. per acre, will help to maintain the fertility of these lands. The subsequent dressings of sulphate of ammonia are all-important, and for successful ratoons, several light dressings early in the lifetime of the crop are absolutely essential. Observation trials indicate that three dressings, each from 150 to 200 lb. per acre, will provide the nitrogen for a heavy ratoon crop.

### Basis for Calculation of Value of Crop Returns.

It is as yet too early to determine the net value of the sugar for the past year's crop, but present indications are that it will approximate £18 15s. per ton. This figure has, therefore, been taken as a basis for our calculations. Fertilizer costs are based on current quotations, and full allowance has been made for freight charges to the respective districts.

The cost of fertilizer application has again been reckoned at 10s. per acre.

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## NORTHERN DIVISION.

The results recorded for the Northern areas (Mossman to Tully) show outstanding benefits from the use of fertilizers. Considering the returns from the fourteen plots here recorded, we find the following average yields from the unfertilized plots and those receiving complete mixtures:—

| | Per acre. Tons. |
|---|---|
| Unfertilized plots .. .. .. .. | 23·9 |
| "Complete fertilizer" plots .. .. | 32·5 |
| Average increase from fertilizer .. .. | 8·6 |

There can be no doubt as to the value of fertilizers, judiciously employed, as an aid in reducing product costs; and, further, the rapid falling off in yields from plant to ratoon crop where fertilizer is not applied, makes it clearly evident that large additions of plant food are necessary for the maintenance of fertility.

*Location.*—**Messrs. Coulthard and Cox's farm, Saltwater, Mossmann.**

*Soil Type.*—Alluvial soil; very acid and of characteristic bleached colour.

*Variety.*—HQ 426. Age of crop—Ten months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 280 lb. Sulphate of Ammonia + 400 lb. Superphosphate. | 280 lb. Sulphate of Ammonia + 200 lb. Potash. | 400 lb. Superphosphate + 200 lb. Potash. | 280 lb. Sulphate of Ammonia + 400 lb. Superphosphate + 200 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 12·0 | 16·4 | 19·7 | 11·3 | 18·8 |
| C.C.S. in cane .. .. .. | 16·5% | 16·5% | 16·2% | 16·5% | 15·9% |
| Value of crop .. .. .. | £25 16 0 | £35 6 0 | £41 8 0 | £24 6 0 | £38 11 0 |
| Less harvesting costs .. .. | £4 18 0 | £5 18 0 | £7 1 0 | £4 18 0 | £6 15 0 |
| Return .. ... .. .. | £20 18 0 | £29 8 0 | £34 7 0 | £19 8 0 | £31 16 0 |
| Increased or decreased return due to fertilizer .. .. .. | .. | Increased. £8 10 0 | Increased. £13 9 0 | Decreased. £1 10 0 | Increased. £10 18 0 |
| Cost of fertilizer and application | .. | £3 2 0 | £3 10 0 | £3 6 0 | £4 14 0 |
| Profit or loss from fertilizer .. | .. | Profit. £5 8 0 | Profit. £9 19 0 | Loss. £4 16 0 | Profit. £6 4 0 |

The results from the ratoon crop follow those from the plant crop very closely. Sulphate of ammonia was again responsible for a marked increase in yield, and the returns also suggest a potash deficiency. Response to sulphate of ammonia has been observed consistently for all plot trials at Mossman, and these gains indicate the benefits to be derived from green manuring in this area.

*Location.*—**J. Rice's farm, Redlynch, Cairns.**

*Soil Type.*—Red schist soil on gentle slope.

*Variety.*—Badila. Age of crop—Thirteen months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 250 lb. Sulphate of Ammonia + 300 lb. Superphosphate. | 250 lb. Sulphate of Ammonia + 200 lb. Potash. | 300 lb. Superphosphate + 200 lb. Potash. | 250 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 200 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 23·5 | 28·1 | 23·6 | 26·8 | 26·1 |
| Value of crop .. .. .. | £38 16 0 | £46 7 0 | £38 19 0 | £44 4 0 | £43 1 0 |
| Less harvesting costs .. .. | £9 0 0 | £10 16 0 | £9 1 0 | £10 6 0 | £10 0 0 |
| Return .. .. .. .. | £29 16 0 | £35 11 0 | £29 18 0 | £33 18 0 | £33 1 0 |
| Increased return due to fertilizer | .. | £5 15 0 | £0 2 0 | £4 2 0 | £3 5 0 |
| Cost of fertilizer and application | .. | £2 13 0 | £3 7 0 | £3 0 0 | £4 5 0 |
| Profit or loss from fertilizer .. | .. | Profit. £3 2 0 | Loss. £3 5 0 | Profit. £1 2 0 | Loss. £1 0 0 |

Certain plots in this trial were, unfortunately, damaged by grubs. Until this time, undoubted response to superphosphate could be observed.

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*Location.*—**W. W. Chapman's farm, Hambledon.**

*Soil Type.*—Red schist soil on gentle slope.

*Variety.*—Badila. Age of crop—Thirteen months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 360 lb. Sulphate of Ammonia + 360 lb. Superphosphate. | 360 lb. Sulphate of Ammonia + 200 lb. Potash. | 360 lb. Superphosphate + 200 lb. Potash. | 360 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 200 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 12·9 | 23·3 | 28·8 | 14·9 | 27·6 |
| Value of crop .. .. .. | £21 6 0 | £38 9 0 | £47 10 0 | £24 12 0 | £45 11 0 |
| Less harvesting costs .. .. | £5 12 0 | £8 19 0 | £11 1 0 | £5 18 0 | £10 12 0 |
| Return .. .. .. .. | £15 14 0 | £29 10 0 | £36 9 0 | £18 14 0 | £34 19 0 |
| Increased return due to fertilizer | .. | £13 16 0 | £20 15 0 | £3 0 0 | £19 5 0 |
| Cost of fertilizer and application | .. | £3 8 0 | £3 18 0 | £3 4 0 | £5 0 0 |
| Profit or loss from fertilizer .. | .. | Profit. £10 8 0 | Profit. £16 17 0 | Loss. £0 4 0 | Profit. £14 5 0 |

The increased yield on all plots receiving sulphate of ammonia is very striking. There was also a definite response to potash, but not to superphosphate. This trial is being continued to the second ratoon crop, and it will be of interest to follow the yields on those plots where nitrogen is withheld.

---

*Location.*—**G. Cole's farm, Edmonton.**

*Soil Type.*—Schist soil.

*Variety.*—Q 813. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 450 lb. Superphosphate. | 240 lb. Sulphate of Ammonia + 200 lb. Potash. | 450 lb. Superphosphate + 200 lb. Potash. | 240 lb. Sulphate of Ammonia + 450 lb. Superphosphate + 200 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. .. | 13·3 | 22·8 | 18·4 | 19·6 | 23·1 |
| Value of crop .. .. .. | £21 19 0 | £37 12 0 | £30 7 0 | £32 7 0 | £38 2 0 |
| Less harvesting costs .. .. | £5 9 0 | £8 15 0 | £7 1 0 | £7 10 0 | £8 17 0 |
| Return .. .. .. .. | £16 10 0 | £28 17 0 | £23 6 0 | £24 17 0 | £29 5 0 |
| Increased return due to fertilizer | .. | £12 7 0 | £6 16 0 | £8 7 0 | £12 15 0 |
| Cost of fertilizer and application | .. | £3 1 0 | £3 6 0 | £3 9 0 | £4 13 0 |
| Profit from fertilizer .. .. | .. | £9 6 0 | £3 10 0 | £4 18 0 | £8 2 0 |

This trial was commenced with the first ratoons, and the consistent response to sulphate of ammonia on the schist soil is again most definite. On this block superphosphate showed an increased yield, with little response to potash.

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*Location.*—**M. Feldman's farm, McDonnell Creek, Babinda.**

*Soil Type.*—Gravelly loam (granitic).

*Variety.*—Black Innis. Age of crop—Twelve months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 360 lb. Sulphate of Ammonia + 360 lb. Superphosphate. | 360 lb. Sulphate of Ammonia + 210 lb. Potash. | 360 lb. Superphosphate + 210 lb. Potash. | 360 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 210 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 17·2 | 22·2 | 22·9 | 18·1 | 22·4 |
| C.C.S. in cane .. .. .. | 12·8% | 11·8% | 11·6% | 12·8% | 11·5% |
| Value of crop .. .. .. | £26 4 0 | £30 2 0 | £30 6 0 | £27 11 0 | £29 5 0 |
| Less harvesting costs .. .. | £6 12 0 | £8 10 0 | £8 16 0 | £6 19 0 | £8 12 0 |
| Return .. .. .. .. | £19 12 0 | £21 12 0 | £21 10 0 | £20 12 0 | £20 13 0 |
| Increased return due to fertilizer | .. | £2 0 0 | £1 18 0 | £1 0 0 | £1 1 0 |
| Cost of fertilizer and application | .. | £2 18 0 | £3 18 0 | £3 5 0 | £5 1 0 |
| Loss from fertilizer .. .. | .. | £0 18 0 | £2 0 0 | £2 5 0 | £4 0 0 |

Though a definite increase in crop yield was effected by fertilizer, the block was harvested so early in the season that the manured cane was quite immature, and therefore losses were shown for all treatments. The need for heavy dressings of sulphate of ammonia on the gravelly loams of the North was again demonstrated on this trial block.

*Location.*—**J. H. Jackson's farm, Babinda.**

*Soil Type.*—Gravelly loam (granitic).

*Variety.*—Badila. Age of crop—Thirteen months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 360 lb. Superphosphate. | 240 lb. Sulphate of Ammonia + 140 lb. Potash. | 360 lb. Superphosphate + 140 lb. Potash. | 240 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 140 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 29·6 | 35·4 | 36·8 | 29·1 | 38·0 |
| C.C.S. in cane .. .. .. | 16·2% | 17·1% | 16·4% | 15·8% | 16·4% |
| Value of crop .. .. .. | £62 3 0 | £79 13 0 | £78 11 0 | £59 2 0 | £81 2 0 |
| Less harvesting costs .. .. | £11 7 0 | £13 12 0 | £14 2 0 | £11 3 0 | £14 11 0 |
| Return .. .. .. .. .. | £50 16 0 | £66 1 0 | £64 9 0 | £47 19 0 | £66 11 0 |
| Increased or decreased return due to fertilizer .. .. .. | .. | Increased. £15 5 0 | Increased. £13 13 0 | Decreased. £2 17 0 | Increased. £15 15 0 |
| Cost of fertilizer and application | .. | £2 16 0 | £2 16 0 | £2 15 0 | £3 18 0 |
| Profit or loss from fertilizer .. | .. | Profit. £12 9 0 | Profit. £10 17 0 | Loss. £5 12 0 | Profit. £11 17 0 |

On the plant crop sulphate of ammonia produced an increased yield of 5 tons of cane per acre; on the subsequent first ratoons the increase was 9 tons per acre. It is interesting to note that the plots receiving a complete manure averaged 40·4 tons of cane for the plant crop, and 38·0 tons for the ratoons. These results clearly demonstrate the value of manures in maintaining the productive capacity of land of this soil type.

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*Location.*—**H. J. Thomas's farm, Bartle Frere, Babinda**

*Soil Type.*—Red volcanic loam.

*Variety.*—Badila. Age of crop—Twelve months. Nature of crop—Plant cane.

RESULTS.

| — | All Plots received {300 lb. Sulphate of Ammonia, 300 lb. Superphosphate} plus— | | | | |
|---|---|---|---|---|---|
| | No Potash. | 100 lb. Muriate of Potash. | 200 lb. Muriate of Potash. | 300 lb. Muriate of Potash. | 400 lb. Muriate of Potash. |
| Tons cane per acre .. .. | 27·7 | 31·5 | 33·4 | 34·5 | 35·5 |
| C.C.S. in cane .. .. .. | 13·9% | 14·2% | 14·0% | 14·2% | 13·9% |
| Value of crop .. .. .. | £47 8 0 | £55 11 0 | £57 15 0 | £60 16 0 | £60 16 0 |
| Less harvesting costs .. .. | £10 12 0 | £12 2 0 | £12 16 0 | £13 5 0 | £13 12 0 |
| Return .. .. .. .. .. | £36 16 0 | £43 9 0 | £44 19 0 | £47 11 0 | £47 4 0 |
| Increased return due to fertilizer | .. | £6 13 0 | £8 3 0 | £10 15 0 | £10 8 0 |
| Cost of fertilizer and application | .. | £1 6 0 | £2 2 0 | £2 18 0 | £3 14 0 |
| Profit from fertilizer .. .. | .. | £5 7 0 | £6 1 0 | £7 17 0 | £6 14 0 |

This trial marks the first attempt at a "quantitative" experiment on the red volcanic loam. The potash dressings showed progressively increasing profits up to the 300 lb. per acre application. It was found also that the crop was over-mature at harvesting—particularly with the heavier potash dressings. In all probability a very definite improvement in the c.c.s. value of the cane would have been experienced had the crop been harvested earlier. This influence will be studied in detail on the ratoons.

*Location.*—**L. Grima's farm, Mundoo, Innisfail.**

*Soil Type.*—Highly leached mixed soil—alluvial and volcanic.

*Variety.*—Pompey. Age of crop—Fifteen months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 300 lb. Sulphate of Ammonia + 500 lb. Superphosphate. | 300 lb. Sulphate of Ammonia + 250 lb. Potash. | 500 lb. Superphosphate + 250 lb. Potash. | 300 lb. Sulphate of Ammonia + 500 lb. Superphosphate + 250 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 20·5 | 31·6 | 29·0 | 33·7 | 35·3 |
| Value of crop .. .. .. | £33 17 0 | £52 3 0 | £47 17 0 | £55 12 0 | £58 5 0 |
| Less harvesting costs .. .. | £7 17 0 | £12 2 0 | £11 2 0 | £12 18 0 | £13 11 0 |
| Return .. .. .. .. | £26 0 0 | £40 1 0 | £36 15 0 | £42 14 0 | £44 14 0 |
| Increased return due to fertilizer | .. | £14 1 0 | £10 15 0 | £16 14 0 | £18 14 0 |
| Cost of fertilizer and application | .. | £3 10 0 | £4 0 0 | £4 0 0 | £4 10 0 |
| Profit from fertilizer .. .. | .. | £10 11 0 | £6 15 0 | £12 14 0 | £14 4 0 |

The selected block is typical of much of the Mundoo area—a highly leached soil of markedly low productivity. This trial demonstrates conclusively the nature of this deficiency, and heavy applications of phosphate and potash produced very definite results. A crop of legumes was ploughed under prior to the planting of the cane; this probably accounts for the slight increase in yield from sulphate of ammonia.

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*Location.*—**B. B. Ross's farm, Mourilyan.**

*Soil Type.*—Acid alluvial soil of Johnstone River.

*Variety.*—Badila. Age of crop—Fourteen months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 360 lb. Superphosphate. | 240 lb. Sulphate of Ammonia + 120 lb. Potash. | 360 lb. Superphosphate + 120 lb. Potash. | 240 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 120 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 38·4 | 44·2 | 41·3 | 42·4 | 45·1 |
| C.C.S. in cane .. .. .. | 12·7% | 12·7% | 12·7% | 13·2% | 13·4% |
| Value of crop .. .. .. | £57 17 0 | £66 11 0 | £62 4 0 | £63 17 0 | £67 18 0 |
| Less harvesting costs .. .. | £14 15 0 | £16 19 0 | £15 17 0 | £16 5 0 | £17 6 0 |
| Return .. .. .. .. | £43 2 0 | £49 12 0 | £46 7 0 | £47 12 0 | £50 12 0 |
| Increased return due to fertilizer | .. | £6 10 0 | £3 5 0 | £4 10 0 | £7 10 0 |
| Cost of fertilizer and application | .. | £2 16 0 | £2 13 0 | £2 12 0 | £3 16 0 |
| Profit from fertilizer .. .. | .. | £3 14 0 | £0 12 0 | £1 18 0 | £3 14 0 |

This typical alluvial soil had been green-manured and limed prior to planting. Superphosphate was responsible for a yield increase of 3·8 tons of cane per acre, and, in spite of the green manure, sulphate of ammonia produced an added 2·7 tons. The influence of the potash appears to be confined to earlier maturity, as shown by the improved c.c.s. values recorded in the last two treatments.

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*Location.*—**G. Marano's farm, Mourilyan.**

*Soil Type.*—Grey, sandy soil.

*Variety.*—Badila. Age of crop—Sixteen months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate. | 240 lb. Sulphate of Ammonia + 210 lb. Potash. | 360 lb. Super-phosphate + 210 lb. Potash. | 240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate + 210 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 22·2 | 29·9 | 26·7 | 23·6 | 28·7 |
| Value of crop .. .. .. | £39 19 0 | £53 16 0 | £48 1 0 | £42 10 0 | £51 13 0 |
| Less harvesting costs .. .. | £8 10 0 | £11 9 0 | £10 5 0 | £9 1 0 | £11 0 0 |
| Return .. .. .. .. | £31 9 0 | £42 7 0 | £37 16 0 | £33 9 0 | £40 13 0 |
| Increased return due to fertilizer | .. | £10 18 0 | £6 7 0 | £2 0 0 | £9 4 0 |
| Cost of fertilizer and application | .. | £2 16 0 | £3 7 0 | £3 6 0 | £5 0 0 |
| Profit or loss from fertilizer .. | .. | Profit. £8 2 0 | Profit. £3 0 0 | Loss. £1 6 0 | Profit. £4 4 0 |

The soil type of this block is the characteristic sand which is cultivated in parts of the area. The particular field had just been brought under the plough. As would be expected on a soil so deficient in humus, nitrogenous fertilizer produced good results; superphosphate showed a gain of 2 tons of cane per acre, but potash was without influence. The ratoon crop might be expected to furnish very interesting results; this is certainly a soil on which heavy fertilizer dressings must be applied consistently to maintain its productivity.

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*Location.*—**H. E. and M. P. Lever's farm, South Johnstone (late Adams Bros.).**

*Soil Type.*—Red schist soil, gentle slope.

*Variety.*—Badila. Age of crop—Fifteen months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 300 lb. Sulphate of Ammonia + 400 lb. Super-phosphate. | 300 lb. Sulphate of Ammonia + 200 lb. Potash. | 400 lb. Super-phosphate + 200 lb. Potash. | 300 lb. Sulphate of Ammonia + 400 lb. Super-phosphate + 200 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 19·8 | 30·3 | 24·1 | 31·2 | 34·2 |
| C.C.S. in cane .. .. .. | 15·4% | 14·7% | 15·6% | 14·8% | 15·0% |
| Value of crop .. .. .. | £38 18 0 | £56 0 0 | £48 3 0 | £58 3 0 | £64 17 0 |
| Less harvesting costs .. . | £7 12 0 | £11 12 0 | £9 5 0 | £11 19 0 | £13 2 0 |
| Return .. .. .. .. | £31 6 0 | £44 8 0 | £38 18 0 | £46 4 0 | £51 15 0 |
| Increased return due to fertilizer | .. | £13 2 0 | £7 12 0 | £14 8 0 | £20 9 0 |
| Cost of fertilizer and application | .. | £3 4 0 | £3 12 0 | £3 6 0 | £4 16 0 |
| Profit from fertilizer .. .. | .. | £9 18 0 | £4 0 0 | £11 2 0 | £15 13 0 |

The soil of this block furnishes an excellent example of the schist soil highly deficient in available phosphates. The increase in yield due to superphosphate was 10 tons per acre, while potash was responsible for further 4 tons of cane, and sulphate of ammonia for 3 tons. This is undoubtedly a soil on which consistently heavy fertilizer applications are needed to build up its fertility.

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*Location.*—**F. N. King's farm, Jaffa.**

*Soil Type.*—Gravelly loam (granitic).

*Variety.*—Badila. Age of crop—Thirteen months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 250 lb. Sulphate of Ammonia + 375 lb. Super-phosphate. | 250 lb. Sulphate of Ammonia + 175 lb. Potash. | 375 lb. Super-phosphate + 175 lb. Potash. | 250 lb. Sulphate of Ammonia + 375 lb. Super-phosphate + 175 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 34·4 | 42·1 | 37·8 | 37·7 | 44·2 |
| C.C.S. in cane .. .. .. | 16·6% | 15·8% | 16·5% | 16·4% | 16·3% |
| Value of crop .. .. .. | £74 12 0 | £85 11 0 | £81 6 0 | £80 9 0 | £93 12 0 |
| Less harvesting costs .. .. | £13 4 0 | £16 3 0 | £14 10 0 | £14 9 0 | £16 19 0 |
| Return .. .. .. .. | £61 8 0 | £69 8 0 | £66 16 0 | £66 0 0 | £76 13 0 |
| Increased return due to fertilizer | .. | £8 0 0 | £5 8 0 | £4 12 0 | £15 5 0 |
| Cost of fertilizer and application | .. | £2 17 0 | £3 3 0 | £3 1 0 | £4 5 0 |
| Profit from fertilizer .. .. | .. | £5 3 0 | £2 5 0 | £1 11 0 | £11 0 0 |

The plant crop from this block followed immediately after "stumping"; each treatment failed to show a profitable increase on that crop, but the position is decidedly different for the first ratoons. Both superphosphate and sulphate of ammonia contributed equally to the increase, and these results demonstrate very clearly the rapid rate at which the plant-food supply of this soil type is depleted. It is interesting to note that the first ratoon plots receiving complete fertilizer actually outyielded those of the plant crop.

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*Location.*—**A. Cousin's farm, Feluga, Tully.**

*Soil Type.*—Gravelly loam (granitic).

*Variety.*—Badila. Age of crop—Eleven and a-half months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate. | 240 lb. Sulphate of Ammonia + 180 lb. Potash. | 360 lb. Super-phosphate + 180 lb. Potash. | 240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate + 180 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 25·6 | 34·8 | 29·9 | 34·3 | 31·6 |
| C.C.S. in cane .. .. .. | 15·7% | 15·2% | 15·4% | 15·3% | 15·3% |
| Value of crop .. .. .. | £51 11 0 | £67 3 0 | £58 14 0 | £66 16 0 | £61 11 0 |
| Less harvesting costs .. .. | £9 16 0 | £13 7 0 | £11 9 0 | £13 3 0 | £12 2 0 |
| Return .. .. .. .. | £41 15 0 | £53 16 0 | £47 5 0 | £53 13 0 | £49 9 0 |
| Increased return due to fertilizer | .. | £12 1 0 | £5 10 0 | £11 18 0 | £7 14 0 |
| Cost of fertilizer and application | .. | £2 16 0 | £3 3 0 | £3 2 0 | £4 5 0 |
| Profit from fertilizer .. .. | .. | £9 5 0 | £2 7 0 | £8 16 0 | £3 9 0 |

The influence of soil variability again entered to vitiate the results of this trial, but there is a definite over-all increase from fertilizer.

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*Location.*—**H. Spencer's farm, Feluga, Tully.**

*Soil Type.*—Gravelly loam (granitic).

*Variety.*—Badila. Age of crop—Twelve months. Nature of crop—Plant cane.

RESULTS.

| — | All Plots received 100 lb. potash: in addition— | | | | |
|---|---|---|---|---|---|
| | No Further Fertilizer. | 200 lb. Sulphate of Ammonia + 250 lb. Super-phosphate. | 200 lb. Sulphate of Ammonia + 500 lb. Super-phosphate. | 400 lb. Sulphate of Ammonia + 250 lb. Super-phosphate. | 400 lb. Sulphate of Ammonia + 500 lb. Super-phosphate. |
| Tons cane per acre .. .. | 36·8 | 41·1 | 41·7 | 43·8 | 44·4 |
| C.C.S. in cane .. .. .. | 14·3% | 14·6% | 14·7% | 14·2% | 14·1% |
| Value of crop .. .. .. | £65 10 0 | £75 5 0 | £77 1 0 | £77 4 0 | £77 10 0 |
| Less harvesting costs .. .. | £14 2 0 | £15 15 0 | £16 0 0 | £16 16 0 | £17 0 0 |
| Return .. .. .. .. | £51 8 0 | £59 10 0 | £61 1 0 | £60 8 0 | £60 10 0 |
| Increased return due to fertilizer | .. | £8 2 0 | £9 13 0 | £9 0 0 | £9 2 0 |
| Cost of fertilizer and application | .. | £2 5 0 | £3 0 0 | £3 4 0 | £3 19 0 |
| Profit from fertilizer .. .. | .. | £5 17 0 | £6 13 0 | £5 16 0 | £5 3 0 |

This "quantitative" trial on the gravelly loam has provided very interesting data. The extra 200 lb. of sulphate of ammonia and 250 lb. of superphosphate have produced increased yields of 2·7 and 0·6 tons of cane respectively. The results suggest that the double dressing of sulphate of ammonia is warranted, but that 250 lb. of superphosphate approximates to the optimum application of this manure. The results of the second ratoons may be expected to supply further valuable information on this point.

[TO BE CONTINUED.]

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## LIQUID MANURE.

To make liquid manure, soak a sugar bag of fresh poultry, cow, or pig manure for a week in a cask with the head knocked in—one holding 40 to 50 gallons is the most handy. Use the resulting solution at the rate of one part to three parts of fresh water. Fill the cask again, and when the manure has soaked for a week use the solution at the rate of one part to one part of fresh water. The cask may then be filled up a third time, and after the liquid has been allowed to stand for a week it may be used neat.

Do not apply liquid manure to plants if the soil is at all dry. Dry soil should first be watered.

# The Grape Phylloxera.

By ROBERT VEITCH, B.Sc., F.E.S., Chief Entomologist.

LATE in 1910 the grape phylloxera (*Phylloxera vitifoliæ* Fitch) was recorded for the first time in Queensland, the infested district on that occasion being Enoggera. Adequate measures were adopted for dealing with the outbreak and nothing further was heard of this serious pest until November, 1932. During that month some vines in a Pinkenba vineyard were considered by their owner to be in an unhealthy condition and a field inspection and laboratory examination revealed the fact that phylloxera was well established in the vineyard. Phylloxera had probably been present for some considerable time in this particular Pinkenba vineyard, but it does not necessarily follow that it was the first centre of infestation in the district.

In view of the recurrence of phylloxera in this State it has been considered desirable to prepare a short illustrated account of this serious pest and of the measures that may be adopted in combating its ravages.

## Economic Status.

The insect commonly known as the grape phylloxera is an aphid or plant louse and is without doubt a serious enemy of the grape vine. It is a native of the eastern United States whence it has spread to other parts of the North American continent, as well as to Europe, Africa, Asia, South America, and Australasia.

It was responsible for tremendous losses following its introduction to Europe some time prior to 1863, and is recorded as having destroyed about one-third of the vineyards of France within twenty-five years of its introduction from the United States. It was accidentally introduced to Victoria in 1875 and, as already mentioned, it occurred in a small district in this State in 1910.

While in no way desiring to minimise the seriousness of this pest, it may be said that it is now regarded with much less concern than was the case in the years immediately following its migration to Europe. This should not be interpreted as a suggestion that the presence of phylloxera in Queensland can be lightly regarded. On the contrary, every possible precaution should be taken to restrict phylloxera to the small area at present known to be infested.

## Nature of Infestation.

An examination of the root system of infested vines at Pinkenba disclosed the presence of large colonies in quite a number of cases.

On the older roots many colonies were found in slight depressions on the root surface (Plate 18, fig. 6). These colonies frequently comprised very considerable numbers of eggs and other stages of the phylloxera aphid, and to the naked eye appeared as small yellowish patches of dust particles not unlike aggregations of curry powder. The effect of the feeding on the older roots is the production of swellings known as tuberosities. These tuberosities eventually decay, the breakdown commencing at, or near, the centre of the tuberosities where the tissue was first pierced by the aphids. The decay of these swellings is hastened by the presence of moist soil conditions.

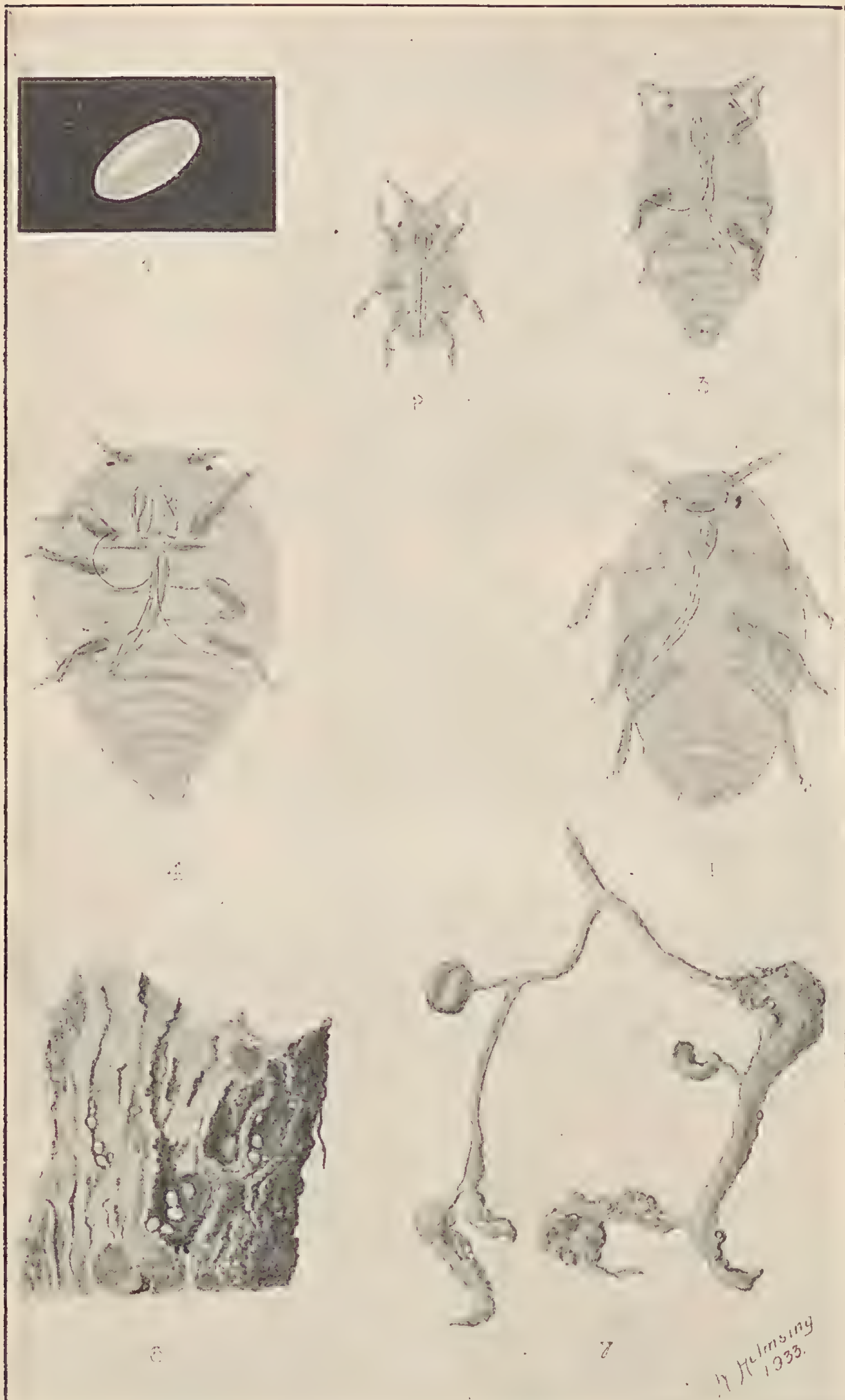

PLATE 18.—THE GRAPE PHYLLOXERA (*Phylloxera vitifoliæ* Fitch).

Fig. 1, Egg x 60. Fig. 2, First Stage Radicicole x 60. Fig. 3, Later Stage Radicicole x 60. Fig. 4, Adult Radicicole x 60. Fig. 5, Nymph, ventral view, x 60. Fig. 6, Portion of Grape Vine Root showing Radicicoles and Eggs *in situ* x 4. Fig. 7, Nodosities on Rootlets x 4.

On the younger white fleshy roots the infestation had quite a different appearance (Plate 18, fig. 7); the illustration of this type of attack shows the presence of scattered specimens of phylloxeræ, and it will be noted that when the phylloxeræ are feeding on the fleshy rootlets, swellings occur which are somewhat similar in appearance to those produced by nematode infestation. These swellings on the young roots are known as nodosities and are rapidly formed as a reaction to the puncturing of the root tissue by the phylloxeræ. Rootlets on which nodosities form generally cease to grow or are greatly retarded in growth and the nodosities themselves decay in a few weeks, the rapidity with which decay takes place being dependent upon temperature and moisture.

The presence of large numbers of phylloxeræ on the roots producing the tuberosities and nodosities just referred to must obviously have a very prejudicial effect on the welfare of the vine. When infestation first occurs it is indicated by a shortening of the canes and a premature yellowing of the leaves. The vines subsequently become more stunted and, where the conditions are favourable for the spread of phylloxera, they eventually die. During the progress of the infestation the vines may produce an unusually abundant crop of grapes, but these are generally small and sour.

In discussing the nature of the infestation attention has so far been confined to the root-inhabiting or radicicole form. A second form, the gallicole or gall-making form, also occurs in some countries, but in this case it is found on the leaves instead of on the roots. This form was not found at Pinkenba and, indeed, although phylloxera has long been established in certain parts of Australia, the leaf gall-making form has been observed only on very rare occasions in this country.

Where the leaf gall-making form occurs the young aphids feed on the upper surface of the leaf, and wherever a puncture has been made the leaf tissue reacts in such a manner as to build a hollow gall within which the insect continues feeding.

Obviously the root-inhabiting form is the more important in so far as the welfare of the vine is concerned, but the leaf-inhabiting form is the more dangerous in so far as the spread of the pest by its own agency is concerned. As has already been indicated, the latter form fortunately has so far been of extremely rare occurrence in Australia.

## Life History.

The life history of the grape phylloxera is distinctly complicated and varies appreciably in different countries. Variation occurs even as between the eastern and the western United States, both the root and leaf gall inhabiting forms occurring in the former, whereas the whole of the Californian infestation has been caused by the root-inhabiting form. Consequently, in view of the short duration of the present Queensland outbreak, little can be said about the life history under Queensland conditions.

The very minute oval yellowish eggs (Plate 18, fig. 1) have been found singly and in clusters on the roots of the vines. The adult root-inhabiting form (Plate 18, fig. 4) is about one twenty-fifth of an inch in length and is yellowish in colour.

### Influence of Soil Type on Infestation.

Elsewhere it is generally considered that infestation rarely occurs in well drained, loose, sandy soil, and, indeed, it has been claimed that vines growing in such soils are almost immune to attack.

Infestation is frequently very severe in vineyards established on low-lying, poorly drained soil lying on a shallow and compact subsoil.

### Control Measures.

In the case of such an outbreak as that under consideration, the first control measure generally undertaken is one ensuring that the pest will have little chance of spreading from the original infested area. The City of Brisbane has accordingly been declared a quarantine area and the Proclamation prohibits the removal "of all plants, or portions of plants, of all and every species of Vitis," excepting only the fruit thereof. Pinkenba is within the City of Brisbane area. The strict observance of this quarantine should materially assist in handling the problem.

Various measures have been adopted for combating the pest in infested districts elsewhere, the three most important of which are soil fumigation, flooding the vineyard, and the selection of suitable resistant root stocks.

Soil fumigation has been extensively employed for combating phylloxera infestation, but there are two important objections to its use in Australia. The first is that the actual cost of the fumigant and its application is distinctly high, and the second is that its efficiency is most pronounced in the sandy soils which, as has already been indicated, are by no means favourable to the development of phylloxera. In some other types of soil more favourable to phylloxera infestation, the results of carbon bisulphide fumigation are much less satisfactory. The use of this insecticide, therefore, cannot be recommended under Queensland conditions.

Paradichlorobenzene has more recently been the subject of experiments in Italian vineyards and promising results have been reported following the use of this soil fumigant. The cost factor would, however, be rather heavy in the case of vineyards, and no recommendation can at present be made in favour of the use of paradichlorobenzene for this purpose.

The flooding of vineyards has been extensively practised in Europe and California, but the application of this control measure is obviously restricted to certain areas in which the water supply is available and the nature of the land permits of safe flooding. In California the practice has been to flood the vineyard to a depth of 6 inches for seven to ten days in autumn, the effect of such treatment being to drown the phylloxeræ. This control measure is going out of favour in California, and greater attention is being paid to the use of resistant root stocks.

Mention has already been made of the fact that phylloxera is a native of the eastern United States, where wild vines have been growing in association with the pest for a very long time. Under these circumstances a number of native American vines have been evolved which show a high degree of resistance to phylloxera infestation. On such vines phylloxera does not increase rapidly in numbers, and even when present the swellings resulting from the feeding of the aphids are sufficiently unimportant to leave the root system in a healthy condition.

The existence of these native American vines has provided the vigneron with a very effective weapon for fighting phylloxera, and the use of resistant root stocks is now the favourite control measure employed against this pest.

The desired European variety is grafted on resistant root stocks, thereby obtaining the required quality of fruit while at the same time preserving the resistance conferred by the root stocks of resistant vines.

One point of importance must be mentioned in connection with the use of resistant root stocks, and that is their comparatively narrow range of adaptability. The European vine is capable of producing good crops on a very wide range of soil types, but such is not necessarily the case with the resistant root stocks. A suitable resistant stock must be one that will flourish under the conditions of soil and climate prevailing in the district in which it will be used and, furthermore, it must be sufficently strong to carry the grafted vine and enable it to produce a large crop of satisfactory quality. The selection of suitable root stocks is, therefore, a matter requiring good local knowledge and experience.

## STRAWBERRY TRIALS.

*The Secretary for Agriculture and Stock (Mr. F. W. Bulcock) has made available the following report by Mr. H. L. Prest, Instructor in Fruit Culture, upon the year's operations at the Strawberry Experiment Plot on the plantation of Mr. W. Mitchell at Chevallum, near Palmwoods:—*

During the 1932 season the following varieties of strawberries have been under observation:—Aurie, Phenomenal, Frenchi, Marguerite-Phenomenal, Bribie Seedling, Cresswell, King Edward, and Wilbur.

Unfavourable seasonal conditions prior to planting caused a shortage of runners; as far as possible selected runners from the previous plot were planted. In order to fill the plot, these were augmented by specially selected runners from Montville, Buderim, Chevallum, and Eudlo.

Following a good strike, weather conditions were dry, and the plants appeared to remain stationary for a period. With more favourable conditions, their growth was rapid and most satisfactory.

*Aurie.*—As in the previous season this variety did remarkably well. Plants were large, healthy, and vigorous, and produced excellent crops. The berries were large, of good colour, and firm texture. The fruiting period was well extended, and an excellent crop of jam fruit was harvested after the main crop.

*Phenomenal.*—In addition to runners from the 1931 plot, it was necessary to obtain runners from Montville, Buderim, Chevallum, and Eudlo. The plants made good growth, budded freely, and an excellent crop set. The berries were large, of good colour and texture. An excellent crop was harvested. The runners from the plot appeared to be most satisfactory, closely followed by those from Montville, Buderim, and Chevallum. Eudlo runners did not appear to be so vigorous.

*Frenchi.*—This variety again proved to be a vigorous grower, fruited well, of good size, colour, and texture. The habit of growth, fruiting, and fruit very closely resemble that of the Phenomenal.

*Marguerite-Phenomenal.*—Selected runners were procured from Buderim. A vigorous grower, fruits well, and of good size, colour, and texture. This variety closely resembles the Phenomenal, and would suggest that the Marguerite strain has run out.

*Bribie Seedling.*—An extremely vigorous grower, with very large medium to dark foliage. Berries small globose conic, dark red in colour, with a rich fruity flavour.

*Cresswell, King Edward, and Wilbur.*—These varieties are strong vigorous growers, the fruit small and dark-red in colour.

*Comments.*—The Aurie and Phenomenals have again shown themselves to be the most suitable varieties for commercial plantings in the Palmwoods and surrounding districts.

The Phenomenal appears to set better fruit where a polleniser is provided. Cresswell and King Edward would appear to be satisfactory pollenisers. Frenchi and Marguerite-Phenomenal can be recommended, though observations to date suggest there is little if any difference between these two varieties and Phenomenal.

# The External Parasites of Sheep.

By F. H. S. ROBERTS, M.Sc., Entomological Branch.

A PARASITE may be defined as an animal which lives in or on another animal and at its expense, the second animal being known as the host. Those parasites which live on the host are known as external parasites or ectoparasites, and are represented by lice and ticks, in contrast to the internal parasites or endoparasites, such as the various species of worms which are to be found infesting the different organs and tissues inside the animal.

External parasites are all arthopods or animals possessing six or eight legs. Those with six legs in the adult stage are insects, those with eight legs mites and ticks. In these notes only parasites which spend all or most of their life on the sheep are dealt with, as these are the most important forms and include the lice, mites, ticks, ked, and blowflies. Such parasites as the many species of biting flies are but temporary in their parasitism, visiting the animals only when food is required, and as, moreover, they are not by any means confined to the sheep as a host, they may be regarded as of little consequence.

The various species of blowflies which attack sheep in Queensland have already been dealt with in the October, 1931, issue of this Journal, to which the reader is referred.

Lice, mites, and keds cause itching and scratching. The subsequent loss of nervous energy and the interference with nutrition rapidly bring about a loss in condition. Infested sheep will not fatten, young sheep may remain stunted, and the vitality of the flock may be so decreased as to predispose it to more serious diseases. Biting at the irritation may cause the formation of sores with subsequent blowing by flies; whilst scratching and rubbing result in a serious loss of wool, the fleece being reduced in value as it becomes ragged, broken, and stained with the parasites' excreta.

Infestation with ticks may be regarded as being generally unimportant except in the case of the scrub tick which may be responsible for serious mortalities.

Although some of the external parasites are very minute in size, all, with the exception perhaps of the mites, are visible to the naked eye and can readily be detected on close examination. The poor condition of the sheep and the ragged and broken fleece is usually a sure sign of the presence of these parasites. In view, therefore, of the heavy losses caused through the presence of these pests, losses which in Queensland must be increasing every year, a knowledge of these various parasitic forms and of the methods for combating them is essential to the pastoralist who wishes to protect his flocks from their depredations.

## SHEEP LICE.

Two species of lice are known to be present among sheep in Queensland, the red-headed sheep louse, *Bovicola ovis* L. (*Trichodectes sphærocephalus* Nitzsch), and the foot louse (*Linognathus pedalis* Osborn). They belong to the order *Anoplura*. The red-headed sheep louse is a member of the suborder *Mallophaga*, which includes all those species of lice known as biting lice. Biting lice have the mouth parts formed for feeding upon hair, feathers, skin, scales, and scabby or scurvy

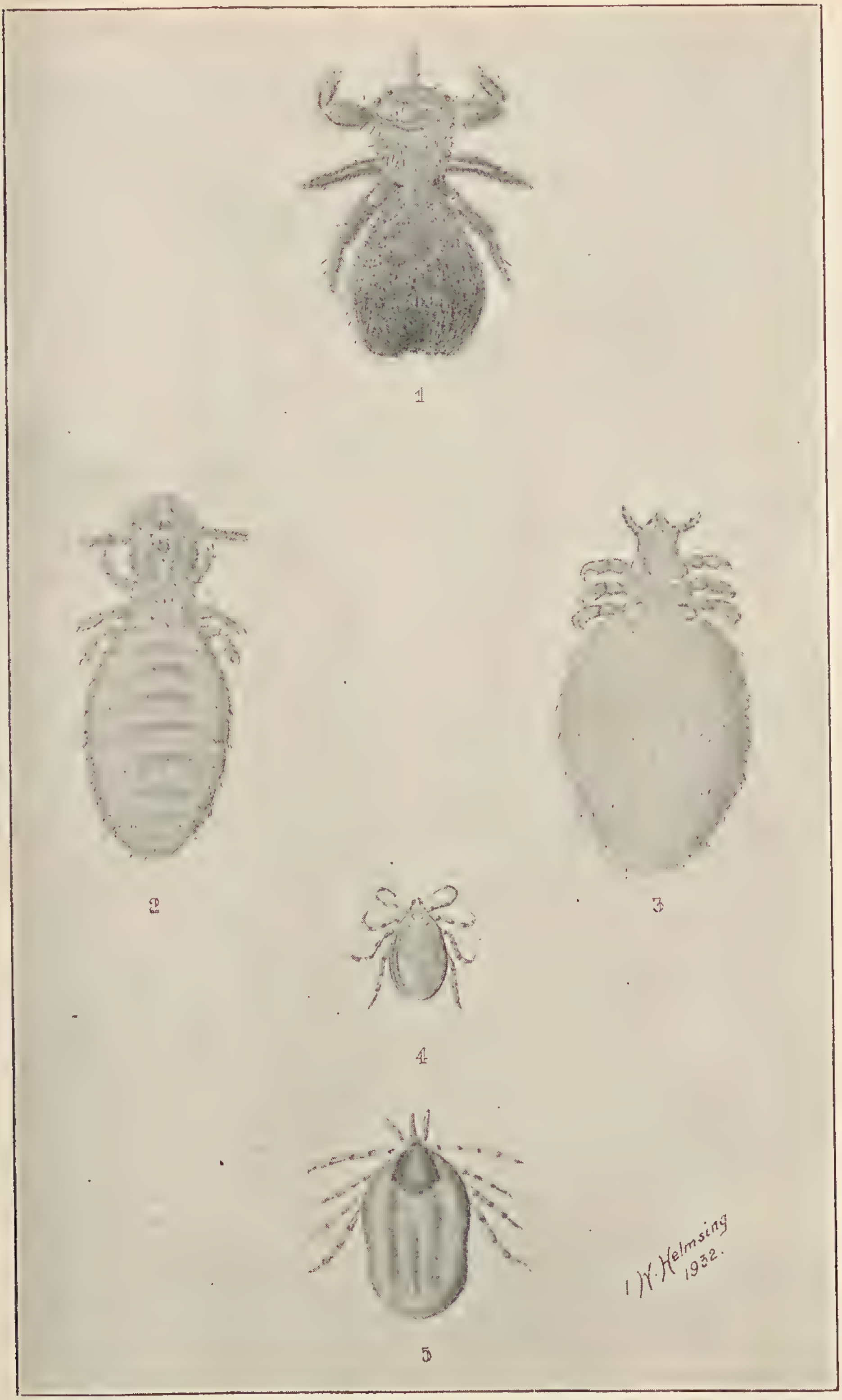


PLATE 19.—EXTERNAL PARASITES OF SHEEP.

FIG. 1—Sheep "Tick" or Ked, *Melophagus ovinus* Linn., × 7.
FIG. 2—Red-headed Sheep Louse, *Bovicola ovis* Linn., × 23.
FIG. 3—Foot Louse, *Linognathus pedalis* Osborn, × 23.
FIG. 4—Scrub Tick, *Ixodes holocyclus* Neumann (Male), × 5.
FIG. 5—Scrub Tick, *Ixodes holocyclus* Neumann (Female), × 5.

material found amongst the hair and feathers of their hosts. They do not suck blood or live on blood in any way except when it occurs scattered on the skin surface through the infested animal biting or scratching itself. These lice are most commonly to be found on birds, though nearly all domesticated animals harbour some species of the suborder.

The foot louse belongs to the suborder *Siphunculata,* which includes the true blood suckers. In this group the mouth parts are formed for piercing the skin and sucking up the blood and fluids. They are to be found on mammals only, and no species of sucking louse occurs among birds.

## Description.

The red-headed sheep louse has been long established in Queensland and is a small flattened insect about one twenty-fifth of an inch in length (Plate 19, fig. 2). The head is broader than long, reddish in colour, with prominent eyes and short three-segmented antennæ. The abdomen is pale brownish with a number of darker transverse bands. The legs are short and yellowish with one terminal claw. This is the more common sheep louse, and is to be found close to the skin among the wool of the neck, shoulders, back, and thighs, though in cases of severe infestation it may occur on all parts of the body.

The foot louse has appeared among Queensland sheep only within recent years, and as yet does not appear to be by any means common. This louse (Plate 19, fig. 3) has a short bluntly pointed head about as wide as it is long. It is much longer and broader than the biting louse, measuring up to one-twelfth of an inch in length. The mouth parts are formed for piercing and sucking. The antennæ are prominent and five-segmented, the terminal segment with three or four bristles. Eyes are absent. The legs are strong, terminating in a powerful claw. The front pair of legs are the smallest, the hind pair the largest. As in all lice, wings are absent. As its name infers, it is to be found about the feet and undersides of the legs towards the belly.

## Life History.*

The life histories of all the species of lice are very similar, that for each species differing only in detail. The eggs, commonly known as "nits," are fastened by the female to the hair, wool, or feathers of the host. After an incubation period of several days the eggs hatch and the young lice appear. They resemble their parents except in size, and reach sexual maturity by a series of moults or castings of the skin.

The eggs of the red-headed louse hatch in from six to eight days, though in cold weather they may take as long as ten days. Sexual maturity is reached in sixteen to eighteen days after hatching.

In the case of the foot louse the eggs hatch in ten to eighteen days, the average period of incubation being about twelve days. The young lice begin to lay eggs when they are eleven to twelve days old.

## Means of Spread.

Once present in a flock lice spread very rapidly. Most cases of lice infestation occur from direct contact, but it should not be forgotten

* The life history figures given in these notes are taken from records made in other Australian States and in the United States of America, but it is not thought that Queensland conditions would induce any great degree of variation in the respective periods.

that it is possible for clean sheep to become infested from yards, sheds, and paddocks which have previously housed lousy sheep.

The lice spend the whole of their life on the sheep and can live only a short time off the host. When removed from the sheep, sucking lice live about three or four days, and biting lice six to eight days. Under such conditions the lice do not ordinarily continue to lay eggs, but eggs attached to wool may continue to hatch for three weeks or longer when detached from the sheep and kept in a warm place. Young lice will live only three or four days off the sheep. Thus it will be seen that paddocks and yards containing scraps of wool detached from the sheep when rubbing and biting themselves may remain infective for at least twenty-five days. Shearing sheds in which lousy sheep have been shorn are probably one of the greatest sources of infestation. During the process of shearing and handling the fleeces some of the parasites become detached and tags of wool containing lice and eggs are scattered throughout the shed. During cold weather dislodged lice and eggs are usually not a source of danger, as the lice become inactive and the eggs fail to hatch. This also applies to infested yards and paddocks. During warm weather, as previously mentioned, the shed may, however, be a source of infestation for twenty-five days or more.

### Control and Eradication.

As lice are the cause of a fairly heavy economic loss to the sheep industry, it should be the aim of any grazier possessing lousy sheep not only to control them but to eradicate them altogether. If clean sheep are to be introduced into an infested property, they should be placed in a paddock which has been spelled at least thirty days. By a system of paddock rotation and, of course, dipping, the eradication of lice is by no means a difficult matter. Particular attention to cleanliness in the shearing shed is essential. If clean sheep are to follow infested sheep after shearing, there should be an interval of thirty days between shearings. If this is not practicable the shed should be thoroughly cleaned out, all loose wool gathered and burnt, to be followed up by a liberal washing out with boiling water and a good disinfectant.

For biting-lice two dippings at an interval of fourteen to sixteen days are considered sufficient to eradicate them from a flock. With the foot louse, on the other hand, owing to the extended incubation period of ten to eighteen days, and to the comparatively short maturity period of eleven to twelve days, it is necessary to dip three times at ten-day intervals. Should this be impracticable with large numbers of sheep, a second dipping after the interval recommended for the biting louse will be found to give good results.

## THE SHEEP "TICK."

The sheep "tick" or ked, *Melophagus ovinus*, is not really a tick but a wingless fly. Ticks have eight legs, an inconspicuous head, and a fused thorax and abdomen, while the ked has only six legs and a distinct head, thorax, and abdomen. This parasite belongs to the Dipterous family Hippoboscidæ, members of which, generally known as spider or louse flies, occur on a great variety of animals, especially birds. In colour the ked is reddish or grey brown and may measure up to one-quarter of an inch in length (Plate 19, fig. 1). The head is small and sunk into the thorax. The abdomen is comparatively large, especially when the insect has just fed. The mouth parts are constructed for

piercing and sucking, and the insect lives on blood. It is capable of moving fairly rapidly among the wool, and its movements forwards and sideways are distinctly crab-like. Keds appear to be most numerous among the wool of the neck, breast, shoulders, belly, and thighs.

### Life History.

The female sheep tick is curious in that instead of an egg it lays a fully matured larva which is enclosed in a soft white membrane. This is, strictly speaking, a pupa, but is commonly known as the "egg." The true egg, however, is retained within the body of the female and hatches there. Seven to ten days after the egg hatches the pupa is laid and is attached to the wool by a glue-like substance. In about twelve hours the white membrane hardens and turns brown. After a period varying from nineteen to twenty-four days, depending upon the season of the year, the adult fly emerges from the pupa. In thirteen to twenty-three days after emergence the female lays her first pupa. The life cycle is, therefore, egg and larval stage within the female insect, seven to ten days; pupal period nineteen to twenty-four days; and laying of first pupa thirteen to twenty-three days after emergence. The female deposits her pupæ, for a while at least, at the rate of one every nine days, but the total number she is capable of laying is not known.

### Control.

Like the lice, the ked spends the whole of its life upon the sheep and is incapable of breeding elsewhere as is frequently thought. The adult insect, however, has been known to live as long as eighteen days when detached from the sheep, though usually the survival period rarely extends beyond four or five days. The pupæ have been known to remain viable for as long as forty-six days in tags of wool which have become removed from the sheep by biting and scratching. Here again, as in the case of lice, sheep may become infested in two ways—either by contact with other infested sheep, which no doubt is the chief method of spread, or from yards, sheds, and paddocks which have housed infested sheep. In order, therefore, to make sure that such yards, sheds, and paddocks are clean, it would be necessary to spell them during the warmer months for a period of about two months. During the winter, however, if the temperature drops to freezing at any period during the day or night, adult ticks will not survive longer than about five days, and as pupæ are readily killed by frosts, such infested yards, &c., need not be spelled longer than a week. Shearing-shed sanitation is again stressed.

In order to get the best results from dipping it is necessary to dip twice. The second dipping is required as, although the first dipping will probably kill all the adult ticks, many of the pupæ will survive and form a nucleus of reinfestation. This second dipping is recommended twenty-one to twenty-five days after the first.

## THE SCRUB TICK.

Four species of ticks have been recorded as attacking sheep in Queensland—namely, the cattle tick, *Boophilus australis;* the brown dog tick, *Rhipicephalus sanguineus;* the Indian dog tick, *Hyalomma ægyptium;* and the scrub tick, *Ixodes holocyclus.* Of these the scrub tick (Plate 19, figs. 4 and 5) is the only one of importance, and at times may be responsible for heavy losses among flocks in ticky areas. *Ixodes holocyclus* is confined practically to the scrubs of the eastern coast, and

not only is it regarded as a serious pest of sheep in these areas, but may also cause fatalities among dogs, cats, foals, calves, and even man. On sheep it is usually to be found on those parts of the body not covered by wool, but when very numerous may be located anywhere on the skin surface.

### Life History.

The natural hosts of this tick are the native marsupials which are to be found in the scrubs. The tick is known as a three-host tick, which means that it drops from the host in order to undergo the moults which terminate one stage in the life cycle and commence another, reattaching itself to another host at the completion of the moult. The female when replete drops from the host on which she has been feeding, and after a period of about eleven to twenty days commences to lay her eggs, as many as 2,500 eggs being deposited. In warm weather the eggs hatch in forty-nine to sixty-one days. The tiny larva or seed tick which emerges has only six legs (adults have eight), and, after remaining quiescent for about seven days, attaches itself to the first suitable animal that comes along and commences to feed. In four to six days the larva is fully fed, drops from the host, and seeks some sheltered spot, remaining there for nineteen to forty-one days, when it moults, and this time the first eight-legged stage appears—the nymph. The nymph in its turn attaches itself to another animal, and, after feeding for four to seven days, drops to the ground and moults again at the end of another twenty-one to seventy-one days. This time the moult produces the adult tick, which in another seven days commences seeking for the final host.

### Injury.

The danger of scrub tick attack lies in the possibility of the inducement of a condition of paralysis. Such a condition is produced by the mature female tick and possibly also by the nymph, and apparently requires at least five days of attachment. The actual cause of this paralysis is unknown, but it is thought to be due to a toxin which is secreted either in the salivary glands or in the ovaries. Recovery may be possible providing the condition is not too far advanced and the ticks removed, but, generally speaking, once paralysis becomes evident the animal dies.

### Control.

Scrub ticks appear to be abundant mainly during the spring months, and during these months short-interval dippings may be found advantageous when small flocks are concerned. The trypan blue treatment which is recommended by the Chief Inspector of Stock is successful if treatment is not left too late. His recommendations are as follows:—

"A 2 per cent. solution (about nine grains to a fluid ounce of water) is made by dissolving the trypan blue in boiling water. A sediment falls as the solution cools, and this should be removed by filtering through a funnel in which a properly folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The solution is used. The hypodermic syringe and needle before being used should be placed in a dish containing water, then placed over the fire and boiled for ten minutes. This is now ready for use when the solution has cooled.

"The injection can be made anywhere under the skin, and in the case of sheep under the arm where the skin is free from wool is the most suitable spot. A fold of skin is caught up with the fingers of the left hand and the needle manipulated with the right hand.

"The dose for sheep is one to five tablespoonsful dependent upon the age of the sheep. A second dose may be given twelve hours after the first should it be deemed necessary."

## SCAB.

This disease is caused by a tiny mite which burrows into the skin tissues and causes the formation of crusts or scales. It is a very serious disease in various parts of the world, but is as yet unknown in Queensland.

### Dipping.

Several good proprietary dips are on the market, the arsenical dips giving, perhaps, the best results. Sheep should be dipped as soon as they have recovered from the shock and knocking about of shearing, and when the wool is long enough to hold the dip—say, about four to six weeks off shears. Since lice, keds, and ticks live on the skin surface and in the fleece, the infested animals need not be held in the dip longer than is necessary to wet the fleece and exposed surfaces. About one minute in the dip is usually considered long enough to wet the animals thoroughly. The heads of all the sheep should be pushed or ducked under the surface long enough to ensure complete wetting. Sheep should not be rushed through the dip.

The number of gallons required to charge a dip may be computed in the following manner:—Add together the length at the dip line and the length of the bottom and divide by two. This gives the average length. Obtain the average width in the same manner, and multiply the average length by the average width in inches, and the product by the depth. Divide this by 231, and the result will be the approximate number of gallons required. As each sheep when freshly shorn will carry out about two quarts of dip, the quantity carried out and retained by the animals plus the quantity required to charge the dip will be a fair estimate of the total quantity of dip required.

Adverse conditions at the time of dipping can and do have a detrimental effect on the result. They are, however, sometimes beyond control, but by using a dip of unvarying and guaranteed consistency good results will be obtained. The care and condition of sheep before and after dipping are matters which should not be overlooked.

Sheep should not be dipped during extremes of heat and cold, when thirsty, or when in a heated state from driving. They should be yarded overnight and dipped early next day so that they may have abundant time to dry before nightfall. When ewes and sucking lambs have been dipped the lambs should be kept apart for some time after dipping. Dipping on cloudy days is not advisable as the sheep take a long time to dry and are exposed to the risk of rain which would decrease the efficacy of the treatment to a large extent.

In conclusion, it may be pointed out that failure to maintain a flock free from external parasites in spite of regular dippings and spelling of yards, &c., may be due to (1) carelessness in mixing the dip; each maker supplies certain instructions with his dip which should be followed implicitly; (2) rushing the sheep through the dip so that each animal fails to get thoroughly wet; (3) failure to make a complete muster; (4) failure to ascertain whether sheep bought between dippings and mixed with the flock are clean or otherwise; and (5) the admission of strangers among the flock through broken boundary fences, &c.

Plate 20.

Saffron Thistle or Star Thistle (Carthamus lanatus).

A spiny plant 2 to 3 feet high. Leaves placed alternately on the stem and not opposite to each other. Leaves placed on stem without a stalklet. Shape of leaves triangular or narrow, 1 to 2 inches long. Each leaf ends in a rigid spine and bears 2 to 4 rigid spines on each margin or side. The veins, of which there are two to three on each side of the midrib, are raised and prominent on the underside of the leaves. The flowers, which are yellow, occur at the ends of the branchlets. Each flower is surrounded by a fairly dense cluster of bracts which are similar to the leaves but are sometimes smaller. Including the spiny leaf-like bracts the flowers are 2 to 3 inches long and 3 to 4 inches across.

*Distribution in the State.*—Both coastal and inland localities are represented by the specimens in the Queensland Herbarium:—Brisbane, Kin Kin, Kingaroy, Mundubbera, Warwick, Roma, and Winton.

The species is a native of the Mediterranean region, and is a common weed in New South Wales.

It has now been declared a noxious weed throughout Queensland.

## AGRICULTURE ON THE AIR.

### Radio Lectures on Rural Subjects.

ARRANGEMENTS have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 3rd January, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers.

Following is a list, continued from the January Journal, of lectures arranged:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK. RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Thursday, 16th March, 1933—"Internal Parasites of Sheep." F. H. S. Roberts, M.Sc., Entomologist.

Tuesday, 21st March, 1933—"Hints to Beginners in Beekeeping." Henry Hacker, F.E.S., Entomologist.

Thursday, 23rd March, 1933—"Onion Cultivation in Central Queensland." C. S. Clydesdale, Senior Instructor in Agriculture, Rockhampton.

Tuesday, 28th March, 1933—"Marketing of Pigs" (A Review of the Markets). E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Thursday, 30th March, 1933—"Profit and Loss in Pig Production." L A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 4th April, 1933—"Breeding Poultry Stock." P. Rumball, Poultry Expert.

Thursday, 6th April, 1933—"Feeding for Egg Production." J. J. McLachlan, Poultry Inspector.

Tuesday, 11th April, 1933—"Potato Diseases." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Thursday. 13th April—"Animal Health." D. Forsyth Stewart, B.V.Sc., Government Veterinary Surgeon.

Tuesday, 18th April, 1933—"Wool Classing for Marketing." J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 20th April, 1933—"Rain Forest Trees and Their Use" W D Francis, Assistant Botanist

Tuesday, 25th April, 1933—"Plants Poisonous to Live Stock in Queensland," Part I. C. T. White, Government Botanist.

Thursday, 27th April, 1933—"Plants Poisonous to Live Stock in Queensland," Part II. C. T. White, Government Botanist.

Tuesday, 2nd May, 1933—"Buffalo Fly Control Measures in North-west Queensland." A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon.

Thursday, 4th May, 1933—"Tuberculosis in Dairy Stock—Incidence, Eradication, and Control." A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon.

Tuesday, 9th May, 1933—"Some Present Problems in Wheat Production" R. E. Soutter, Wheat Breeder.

Thursday, 11th May, 1933—"White Ants." J. A. Weddell, Assistant Entomologist.

Tuesday, 16th May, 1933—"The Progress of Horticulture in Australia." H. J. Barnes, Instructor in Fruit Culture.

Thursday, 18th May, 1933—"Hereditary Unsoundness of Horses." A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon.

Tuesday, 23rd May, 1933—"Sheep Breeding and Selection." J. Carew, Senior Instructor in Sheep and Wool.

Thursday, 25th May, 1933—"Sheep and Their Environment." J. Carew, Senior Instructor in Sheep and Wool.

Tuesday, 30th May, 1933—"Soils and Soil Fertility." E. H. Gurney, Senior Analyst.

## PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of Australian Illawarra Shorthorn Society, Jersey Cattle Society, and Friesian Cattle Society, production charts for which were completed during the month of November, 1932 (273 days period unless otherwise stated).

| Name of Cow. | Owner. | Milk Production. | Butter Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| **AUSTRALIAN ILLAWARRA SHORTHORNS.** | | | | |
| MATURE COWS (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| Cherry 7th of Rosemount | A. J. Bryce, Maleny | 13,733 | 612·295 | Bright Star of Cosey Camp |
| Dorothy of Penrhos | A. Sandilands, Wildash | 10,893 | 463·477 | Admiration of Strathdhu |
| Lyndith Betty 2nd | S. Teese, Veresdale | 11,988·39 | 413·287 | Redman |
| Rosebud II. of Wilga Vale | C. O'Sullivan, Greenmount | 10,694·75 | 401·935 | Reliance of Blackland |
| Model's Pride (240 days) | S. Teese, Veresdale | 9,793 | 379·887 | Bessie's Royal |
| Bella 7th of Fairlie | C. B. Mitchell, Fairlie | 9,670 | 366·285 | Kitchener of Burradale |
| Sheila of Penrhos | A. Sandilands, Wildash | 8,258·75 | 363·106 | Gentle Lad of Towans |
| Melba 6th of Rosemount | A. J. Bryce, Maleny | 9,076·35 | 359·354 | Bright Star of Cosey Camp |
| Perfect 2nd of Rosenthal (365 days | S. Mitchell, Warwick | 12,902 | 576·497 | Drummer |
| Rosebud 9th of Rosenthal (365 days) | S. Mitchell, Warwick | 12,467 | 550·214 | Sunshine |
| SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB. | | | | |
| Princess 8th of Fairlie | C. B. Mitchell, Fairlie | 7,560·5 | 334·515 | Dividend of Rosenthal |
| SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 390 LB. | | | | |
| Pansy of Penrhos | A. Sandilands, Wildash | 9,507·25 | 398·508 | Admiration of Strathdhu |
| JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | | |
| Pet 10th of Thornleigh | C. O'Sullivan, Greenmount | 9,360·75 | 334·219 | Fussy's Pride of Fairfield |
| Countess of Mountain Home | M. C. Lester, Laidley Creek West | 8,459·14 | 286·623 | Headlight of Greyleigh |
| SENIOR, 2 YEARS OLD (BETWEEN 2½ AND 3 YEARS), STANDARD 250 LB. | | | | |
| Roan Nellie of Alfavale | W. H. Thompson, Nanango | 9,797·15 | 358·336 | Essential of Greenfield |
| Fairlie Princess 12th | C. B. Mitchell, Fairlie | 7,450·25 | 301·213 | Auditor |
| Westbrook Home Ivy 12th | M. C. Lester, Laidley Creek West | 7,633·23 | 269·577 | Sunrise of Rosenthal |

| | | | | |
|---|---|---|---|---|
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| Molly of Penrhos | A. Sandilands, Wildash | 6,249 | 274·934 | Bonnie Charmer of Coral Brae |
| Greylands Myrtle 2nd | Hemmings Bros., Murray's Bridge | 6,403·75 | 242·768 | Inspector of Greyleigh |
| JERSEY. | | | | |
| MATURE COWS (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| Lassie of Lightfield | J. Mollenhauer, Moffatdale | 7,607·77 | 380·242 | Laddie Palatine |
| Glengariffe Noble's Rozel 2nd | Cox Bros., Witta | 5,839·55 | 350·095 | Glengariffe Noble's Wellesby |
| JUNIOR, 4 YEARS OLD (BETWEEN 4 AND 4½ YEARS), STANDARD 310 LB. | | | | |
| Golden Empress of Rosedale | Wakefield Bros., Atherton | 6,567·35 | 328·925 | Oxford Prince Palatine |
| Milklass of Rosedale | Wakefield Bros., Atherton | 5,223·35 | 311·16 | Oxford Prince Palatine |
| JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | | |
| Coronada (imp.) | J. Sinnamon, Moggill | 6,576·78 | 370·047 | Wonderful Volunteer |
| Seycombe Golden Grape | A. E. Trigger, Didcot | 4,369·05 | 293·294 | Oxford Northwood King |
| SENIOR, 2 YEARS OLD (BETWEEN 2½ AND 3 YEARS), STANDARD 250 LB. | | | | |
| Boquet's Jubilee of Morago | D. R. Hutton, Cunningham | 5,055·72 | 263·084 | Goldfinder's Heir of Belleview |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| Seycombe Marie | A. E. Trigger, Didcot | 4,571·5 | 293·454 | Carnation Royal |
| Diana of Karoola | N. Alcorn, Maleny | 5,150·6 | 286·337 | Carnations Buttercup's Raleigh |
| Westward Ho Lady Melba | H. N. Thomason, Mount Mee | 4,560 | 282·635 | Ellerdale Nobility |
| Ringlet of Burnleigh | W. W. Mallett, Nambour | 4,663·55 | 271·745 | Trinity Darby |
| Seycombe Gardenia | A. E. Trigger, Didcot | 4,207·5 | 269·888 | Carnation Royal |
| Upwell Sunbeam | A. E. Trigger, Didcot | 3,510·35 | 242·899 | Carnation Prince Charles |
| Dewdrop 5th of Golden Hill | Chas. Klaus, Mundubbera | 4,525·75 | 244·503 | Pride's Hero of Bunleigh |
| Montrose Fern of Ellerslie | R. J. Crawford, Inverlaw | 6,126·75 | 234·328 | Montrose Gypsy of Glen Iris |
| Trecarne Milk Gir. III. | D. R. Hutton, Cunningham | 5,606·67 | 324·636 | Trecarne Golden King |
| Westwood Ho Lady Vale | H. N. Thomason, Mount Mee | 4,940·8 | 247·416 | Ellerdale Nobility |
| FRIESIAN. | | | | |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| Oaklands Holly 6th | W. Richters, Tingoora | 7,879·08 | 270·966 | Pied Rock (imp.) |
| Oakland Beauty Rock III. | W. Richters, Tingoora | 7,492·84 | 257·593 | Pied Rock (imp.) |

# Answers to Correspondents.

## BOTANY,

### Bracken.

Inquirer (Port Moresby)—

The common Bracken, *Pteridium aquilinum*, is very common in Australia. It has been thought several times to cause digestive troubles in stock, ultimately resulting in death. Bracken has long been regarded as a poisonous plant in the British Isles and on the Continent, and some years ago feeding tests were carried out by the British Ministry of Agriculture with a large quantity of Bracken, and the results are held to show conclusively that Bracken is poisonous—and fatally so—to cattle which may consume small quantities of it regularly, the poison being cumulative and ultimately causing death. Experiments conducted in British Columbia in 1917 showed that the ingestion of dried Bracken causes staggers in horses, and that in the hard winter of 1915-1916 the mortality among horses was very heavy. One instance is cited in which, out of twenty-four horses owned by eleven farmers, sixteen died of Bracken poisoning and two died from eating the green plant in a pasture where other vegetation was scarce. Bracken contains the poisonous Pteritannic acid, which is identical with the Filicic acid of the Male Fern (*Aspidium filix-mas*). In the cases of horses which died, Müller gives the symptoms as timidity, slower movement or action, loss of balance, dilated pupils, reddening followed by yellowing of the conjunctivæ, and slowing of the pulse. Pammell notes Bracken as an astringent and anthelmintic, and also says it causes enteritis, spasms, and paralysis. Thomson and Sifton indicate staggering, nervousness, constipation, and redness of the eyes, the two latter symptoms serving to distinguish Bracken poisoning from horsetail poisoning. Increasing weakness and great excitement preceded death. Most of these facts are taken from "Plants Poisonous to Live Stock," by H. C. Long, published by the University Press, Cambridge.

### Salt Weed.

J.R.R. (Wooroolin)—

The specimen is *Atriplex semibaccata*, a native plant commonly known as Salt Weed. It is generally regarded as quite a useful fodder, and is not known to be poisonous or harmful to stock in any way. If a plant or plants caused the trouble referred to, it must have been some other than the one you forwarded.

### Wild Lucerne or Emu Grass, Prickly Poppy, Cape Spinach, Molucca Balm.

W.C.H. (Aubigny)—

The specimens have been determined as follows:—

1. *Psoralea tenax*, a native plant popularly known as Wild Lucerne or Emu Grass, and one of the very best of our native fodders. It is not the same plant as the one that has come into prominence as a fodder in North Queensland under the name of Wild Lucerne. That plant is *Stylosanthes mucronata*, a native of the West Indies and tropical America, now naturalised in many warm countries. *Stylosanthes* established itself about Townsville some twenty years ago, and has gradually spread over most of the Northern coastal belt as far south as Rockhampton.
2. *Argemone mexicana* var. *ochroleuca* (Prickly Poppy or Mexican Poppy), a very common weed in parts of Queensland. It has been accused of poisoning stock, and possesses harmful properties. However, it is generally rejected by animals, and the only cases of trouble with it that have come under notice have been where the plant has been cut and allowed to wilt and stock have eaten the wilted plants, with fatal results.
3. *Emex australis* (Bull Head, Prickly Jack, or Cape Spinach), a very bad weed and a native of South Africa. This should certainly be destroyed as soon as possible.
4. *Moluccella lævis*, the Molucca Balm, a native of the Mediterranean region. It is found growing wild here and there on the Darling Downs, but we do not know that it is abundant in any one place. It was probably originally introduced as a garden plant. It is not known to possess any particular properties, harmful or otherwise.

# General Notes.

## Staff Changes and Appointments.

Messrs. J. W., R. J., and E. W. Grieve, of Glenhowden, Colinton, have been appointed Honorary Rangers under the Animals and Birds Acts.

Mr. Martin Shiels, Tallebudgera, via West Burleigh, and Mr. Edwin H. Crease, Upper Tallebudgera, have been appointed Honorary Rangers under "*The Animals and Birds Acts*, 1921 *to* 1924."

Constable H. H. Dunstall, of Richmond, has been appointed also an Inspector under "*The Slaughtering Act of* 1898."

Mr. Thomas Sharp, of Beechmont, via Canungra, has been appointed an Honorary Ranger under the Native Plants Protection Act.

Mr. Henry Flynn, Toll Gate Keeper, Tambourine, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Constable C. W. Greenhalgh (Ilfracombe) and Constable E. McKenzie (Theodore) have been appointed also Inspectors under the Slaughtering Act.

Mr. James Crouch, who holds the lease of Bishop Island, near the mouth of the Brisbane River, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. Henry G. Lamond, of the Holle Islands, Whitsunday Passage, has also been appointed an Honorary Ranger under the abovementioned Acts.

Constable Wm. Robinson, Officer in Charge of Police at Nebo, has been appointed also an Acting Stock Inspector.

Mr. O. L. Hassell, Instructor in Agriculture, Mareeba, has been appointed also an Honorary Ranger under the Animals and Birds Acts.

## Papaw Levy.

Regulations under the Fruit Marketing Organisation Acts have been approved which will empower the Committee of Direction of Fruit Marketing to make a levy on all papaws marketed for the period from 14th December, 1932, to the 13th December, 1933. The levy is payable by growers on the basis of the quantity of papaws sold by them, and is at the rate of one penny for every four cases of papaws or part thereof. The sums raised by the levy shall be expended upon advertising in the interests of the growers concerned.

## Banana Levy Extended.

Executive approval has been given to the issue of a Regulation under the Fruit Marketing Organisation Acts extending the Banana Levy Regulations for a further twelve months, from the 1st January, 1933, to the 31st December, 1933. These Regulations came into force in September, 1927, and have been extended each year since that date. Briefly, they empower the C.O.D. to make a levy on all bananas marketed in the State. The levy is payable by growers on the basis of the value of the bananas sold, and is at the rate of one penny for every £2 or part thereof of the net proceeds from sales. All sums raised by this levy are expended in the interests of the banana section of the fruit-growing industry of Queensland.

## New Brands Regulations.

Regulations under "*The Brands Acts*, 1915 *to* 1932," have been approved which provide for the rescission of all existing Regulations passed in 1915 and subsequently, and for the substitution therefor of fresh Regulations in accordance with the provisions of the consolidated Acts, including the Amendment Act of 1932. The Regulations have not been altered to any great extent, except that the provisions of the Amendment Act passed this session have been given effect to therein.

## Bee-keeping in Wide Bay and Burnett.

An Order in Council under "*The Apiaries Act of* 1931" has been issued which declares the Pastoral Districts of Wide Bay and Burnett to be a district for the purposes of the abovementioned Act. The provisions of the Act were applied to the Pastoral Districts of Moreton and Darling Downs in October, 1931.

# Rural Topics.

## A Profitable Piggery.

With a small but complete herd of breeding stock in the piggery at the Jubilee Sanatorium, Dalby, Queensland, good results have been obtained. The average number of sows kept is six with one purebred boar. Very few pigs are lost between birth and maturity and no disease of any type has been noted, the pigs growing and developing satisfactorily. During the past few years a Duroc Jersey boar has headed the stud, but he has been replaced by a Middle White, as the objective is principally porkers for use at the institution, the pigs not required as porkers being grown to baconer weight and then cured at the bacon factory, the hams and bacon being returned for use of those resident at the Sanitorium. The pig food consists of waste feed from the dining rooms and kitchen, spare vegetable matter, and milk, with grain as required to balance the ration. Matron Nutt is justly proud of her pigs, for they are a profitable investment.

## Points on Poddies.

Always handle calves quietly and patiently. Feed at regular times each day and in regular quantities. Feed only clean sweet milk. Add some constituent to replace the feed value of the cream removed from the milk, and lime-water (see concluding paragraph) to assist digestion. Milk should be pasteurised if possible, and on no account should the froth be given to calves. Feed the milk at body temperature. Cold milk requires a great deal of the animal's energy to heat it up to a point at which digestion can take place. Cleanse feeding buckets as carefully as you would all other dairy utensils. Keep the yard and its surroundings clean and free of harbour for flies, which are active carriers of disease. Provide shade in summer and shelter from winter wind and rain. Provide a suitable lick consisting of salt and bonemeal.

Lime-water of the requisite strength is easily made on the farm. There need be no fear of making it too strong, as water will only dissolve a certain limited amount of lime—½ grain to the ounce, or 10 grains to the pint. Add a bucketful (say 20 lb.) of lime to about 10 gallons of water in a wooden barrel, stir well, and allow to settle. The clear liquid resulting can be used, and water added and stirred daily until all the soluble portion of the lime has dissolved—the lack of alkaline flavour will indicate when this point has been reached, and a fresh supply of lime should be added to the barrel.

## A Prolific and Profitable Sow.

Kingston Patricia, 1346, a Large White sow, bred and owned by the Kingston Pig Farm Company, has proved that the old adage, "there is money in pigs," still carries considerable weight and is as true to-day as ever. "Pat," as she is called, was farrowed on the 25th October, 1930, so is just a little over two years of age. At the age of eleven months (7th October, 1931) she farrowed her first litter of eleven, of which ten were tattooed for entry into the herd records. From this litter, two daughters in due course produced their first families of twelve piglings each. "Pat" farrowed again eight months later (16th June, 1932), producing fifteen pigs, which she won first prize with (sow and litter) at Brisbane Royal National Exhibition, August, 1932. Not content with this, she produced her next litter within five months (23rd October, 1932), and again brought forth fifteen pigs—a tally of forty-one pigs in all while still under two years of age. Such is the prolific nature of the world-renowned Large White breed—a breed noted for other commercial features as well as prolificacy.

## Concrete Bath for Pigs.

An important aid to the health and comfort of swine is the provision of a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling himself, and if the pigyards have a frontage to a stream, well and good, though there is an objection to pigs wallowing in a stream, in so far that infection may be carried down from diseased pigs higher up the stream, and as a result contagion spread over a wide area.

Unfortunately, the hog wallow usually seen on the pig farm consists of a filthy puddle-hole, into which drains all the excrement from the yards, and in the foul mud of this, the only wet spot available, the pigs are compelled to seek relief. If there is infection of any kind in the yard it is to be found in just this place. Such wallows should be drained and filled in, and if there is no naturally clean place for the pigs to lie in, a concrete or similar bath should be built. This can then be kept clean, and the liability to infection from contagious disease will be diminished.

# The Home and the Garden.

## OUR BABIES.

*Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.*

## THE HOUSE FLY.

### Measures for its Control.

A NUMBER of different species occur among the flies commonly referred to as "house-flies," but of those species that cause annoyance in dwellings the common house-fly (*Musca domestica*) is easily the most important and the most widely distributed. This fly is world-wide in distribution, and from its habit of crawling over food after frequenting filth, sick rooms, &c., and carrying with it injurious organisms of all kinds, has been definitely proved by medical men to be the carrier of many of our worst diseases, including typhoid, tuberculosis, dysentery, gastro-enteritis, &c. It is therefore a serious menace to public health, and no effort should be spared to exclude it from the house. If it were only realised that the flies which visit the dining-table may, but a few moments before, have been crawling over garbage or human fæcal matter, or frequenting the room of a person suffering from some disease, there would not be anything like the indifference that is frequently shown to the presence of this pest.

It may not be generally known that the house-fly passes through four stages, viz., the egg, the larva or maggot, the pupa, and the adult two-winged fly. The female lays her eggs chiefly in stable manure, or other fæcal or decaying organic matter. It has been said that a single female can lay from 600 to 900 eggs or more during her lifetime. The eggs hatch in about twenty-four hours, and in warm weather the insect passes quickly through its various stages, taking as little as fourteen days or even less under very favourable conditions, from the laying of the egg to the development of the adult stage. Several generations of flies may thus occur in the course of a season.

### Destruction of Breeding-grounds.

As house-flies breed chiefly in stable manure, the basic principle in their control is the destruction of the breeding-grounds, which can best be carried out by municipal and shire councils. Already many councils have By-laws enabling the enforcement of the disposal or treatment of manure in such a manner as to render it impossible for flies to breed in it.

The methods generally recommended to prevent manure being a breeding-ground for flies are as follows:—

1. The floors of stables should be of concrete and watertight.

2. All manure should be collected, removed, and placed in fly-tight bins or pits at least twice a week.

3. Where this is not possible, especially in rural districts, the manure should be removed at least every two days, and scattered thinly over a field. The manure then dries quickly, and is unsuitable for the breeding of the flies.

4. If the manure is kept in heaps, the breeding of the flies can be prevented by treating the heap with borax at the rate of 1 lb. of borax to 16 cubic feet of manure. It may be applied in solution or the borax sprinkled over the heap and then watered.

The most effective means of keeping flies out of dwellings is to have all doors and windows screened with fly-proof gauze. If such fly-proof doors and windows are not employed, or should any flies gain access to the dwelling by carelessness in shutting them, the flies may be disposed of by spraying with fly sprays, such as pyrethrum-kerosene mixture, by the use of poisoned baits, or by trapping the flies with tanglefoot fly papers or house-fly traps.

### An Effective Spray.

An effective fly spray may be made by mixing 1 lb. of pyrethrum powder with 1 gallon of kerosene; allow to stand over night and strain through a very fine cloth; add 3 oz. of oil of wintergreen to the liquid, which is then ready for use. Quite a large number of proprietary sprays are also available.

Numerous types of fly traps are available, but the old-fashioned glass bell traps or the more recent wire-gauze traps, baited with any substance attractive to the flies, are quite effective.

Poison baits may also be used, and of these formalin is perhaps the safest. The formalin bait is made by mixing two tablespoonfuls of 40 per cent. formalin, one heaped tablespoonful of sugar, ½ pint of clear limewater, and water to make 1 pint. Another formula is to add three teaspoonfuls of commercial formalin to a pint of milk or water sweetened with brown sugar. One method of using is to pour the liquid into a tin perforated with holes through which wicks are passed into the fluid. Another method of exposing the poison to the flies is to line a plate with white blotting-paper and place it over a glass partly filled with formalin solution. The whole is then quickly inverted. The liquid slowly flows out as the solution evaporates from the blotting-paper, and automatically keeps it wet. Yet another method is to pour the liquid into the plate and place in the centre a piece of bread on which the flies alight and feed.—A. and P. Notes, New South Wales Department of Agriculture.

Plate 21.—Laidley Shire—Laidley-Plainlands Road.
An example of "C" class metal construction in a farming area by the Main Roads Commission.

# Orchard Notes for March.

## THE COASTAL DISTRICTS.

IF the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations, which are apt to become somewhat dirty during the gathering of the crop, must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is

10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case of mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be fought systematically in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codling moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

# Farm Notes for March.

LAND on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—i.e., spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in airtight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which show no promise of returning satisfactory yields of grain would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

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## TO NEW SUBSCRIBERS.

**New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.**

**When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.**

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**Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.**

## CLIMATOLOGICAL TABLE—DECEMBER, 1932.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure Mean at 9 a.m. | Shade Temperature. | | | | | | Rainfall. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Means. | | Extremes. | | | | Total. | Wet Days. |
| | | Max. | Min. | Max. | Date. | Min. | Date. | | |
| | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| *Coastal.* | | | | | | | | | |
| Cooktown .. .. | 29·81 | 89 | 75 | 98 | 9 | 71 | 17, 30 | 896* | 10 |
| Herberton .. .. | .. | 85 | 63 | 96 | 7, 9 | 56 | 17 | 714 | 14 |
| Rockhampton .. .. | 29·85 | 89 | 70 | 104 | 8 | 66 | 2, 19 | 954 | 11 |
| Brisbane .. .. | 29·91 | 84 | 67 | 91 | 8, 24 | 62 | 11 | 249 | 7 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. | 29·87 | 87 | 62 | 96 | 7, 16 | 52 | 25 | 477 | 7 |
| Stanthorpe .. .. | .. | 80 | 55 | 89 | 29 | 33 | 25 | 310 | 9 |
| Toowoomba .. .. | .. | 81 | 59 | 90 | 7 | 47 | 25 | 369 | 8 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·76 | 98 | 75 | 106 | 9 | 69 | 24 | 370 | 8 |
| Longreach .. .. | 29·74 | 103 | 75 | 114 | 7 | 62 | 25 | 6 | 2 |
| Mitchell .. .. | 29·82 | 93 | 66 | 104 | 7 | 52 | 26 | 192 | 6 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 29·77 | 96 | 78 | 105 | 10 | 73 | 28 | 106 | 7 |
| Boulia .. .. | 29·73 | 104 | 73 | 113 | 6, 7 | 59 | 26, 28 | 21 | 2 |
| Thargomindah .. .. | 29·78 | 98 | 72 | 106 | 6 | 59 | 25 | 11 | 1 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING DECEMBER, 1932, AND 1931 FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. | | Total Rainfall. | |
|---|---|---|---|---|
| | Dec. | No. of Years' Records. | Dec., 1932. | Dec., 1931. |
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 7·53 | 31 | 9·62 | 9·39 |
| Cairns .. .. | 8·93 | 50 | 15·49 | 23·95 |
| Cardwell .. .. | 8·20 | 60 | 9·17 | 13·92 |
| Cooktown .. .. | 6·80 | 56 | 8·96 | 10·25 |
| Herberton .. .. | 5·87 | 46 | 7·17 | 7·89 |
| Ingham .. .. | 6·82 | 40 | 11·43 | 7·47 |
| Innisfail .. .. | 11·78 | 51 | 27·01 | 23·35 |
| Mossman Mill .. | 11·03 | 19 | 14·84 | 11 69 |
| Townsville .. .. | 5·49 | 61 | 8·63 | 8·31 |
| *Central Coast.* | | | | |
| Ayr .. .. | 4·13 | 45 | 4·80 | 15·50 |
| Bowen .. .. | 4·51 | 61 | 3·53 | 11·06 |
| Charters Towers .. | 3·42 | 50 | 3·09 | 1·63 |
| Mackay .. .. | 7·22 | 61 | 11·37 | 5·92 |
| Proserpine .. .. | 8·22 | 29 | 8·35 | 15·81 |
| St. Lawrence .. | 4·76 | 61 | 9·70 | 8·91 |
| *South Coast.* | | | | |
| Biggenden .. .. | 4·60 | 33 | 2·39 | 6·19 |
| Bundaberg .. .. | 5·02 | 49 | 2·68 | 9·44 |
| Brisbane .. .. | 4·89 | 81 | 2·49 | 9·11 |
| Caboolture .. .. | 5·22 | 45 | 1·31 | 7·80 |
| Childers .. .. | 5·61 | 37 | 4·24 | 7·60 |
| Crohamhurst .. | 7·05 | 39 | 1·82 | 7·71 |
| Esk .. .. | 4·74 | 45 | 2·49 | 4·09 |
| Gayndah .. .. | 4·21 | 61 | 2·09 | 9·50 |
| Gympie .. .. | 6·04 | 62 | 2·67 | 8·85 |
| Kilkivan .. .. | 4·51 | 53 | 2·21 | 4·68 |
| Maryborough .. | 4·75 | 60 | 4·25 | 8·95 |
| *South Coast—continued—* | In. | | In. | In. |
| Nambour .. .. | 6·89 | 36 | 3·14 | 10·26 |
| Nanango .. .. | 3·82 | 50 | 3·83 | 3·71 |
| Rockhampton .. | 4·77 | 45 | 9·54 | 7·66 |
| Woodford .. .. | 5·62 | 45 | 3·54 | 5·51 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 3 22 | 62 | 4·77 | 3·89 |
| Emu Vale .. .. | 3·49 | 36 | 3·28 | 3·52 |
| Jimbour .. .. | 3·22 | 44 | 2·98 | 2·76 |
| Miles .. .. | 3·09 | 47 | 2·17 | 7·12 |
| Stanthorpe .. | 3·52 | 59 | 3·10 | 3·74 |
| Toowoomba .. | 4·43 | 60 | 3·69 | 11·50 |
| Warwick .. .. | 3·39 | 67 | 3·40 | 3·18 |
| *Maranoa.* | | | | |
| Roma .. .. | 2·53 | 58 | 2·61 | 6·77 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 3·08 | 18 | 1·88 | 6·40 |
| Gatton College .. | 3·70 | 33 | 1·46 | 8·99 |
| Gindie .. .. | 2·94 | 33 | 1·53 | 3·54 |
| Hermitage .. | 2·95 | 26 | 2·86 | 2·84 |
| Kairi .. .. | 6·18 | 18 | 9·49 | 5·83 |
| Mackay Sugar Experiment Station | 8·50 | 35 | 8·03 | 6·17 |

GEORGE E. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

| | February, 1933. | | March, 1933. | | MOONRISE. Feb., 1933. | MOONRISE. Mar., 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | a.m. | a.m. |
| 1 | 5·28 | 6·42 | 5·48 | 6·21 | 11·15 | 9·50 |
| 2 | 5·29 | 6·42 | 5·49 | 6·20 | 11·56 | 10·45 |
| | | | | | p.m. | |
| 3 | 5·29 | 6·41 | 5·49 | 6·19 | 12·57 | 11·32 |
| | | | | | | p.m. |
| 4 | 5·30 | 6·41 | 5·50 | 6·18 | 1·50 | 12·33 |
| 5 | 5·31 | 6·40 | 5·51 | 6·17 | 2·44 | 1·27 |
| 6 | 5·31 | 6·40 | 5·51 | 6·16 | 3·27 | 2·19 |
| 7 | 5·32 | 6·39 | 5·52 | 6·15 | 4·28 | 3·8 |
| 8 | 5·33 | 6·39 | 5·52 | 6·14 | 5·17 | 3·53 |
| 9 | 5·33 | 6·38 | 5·53 | 6·13 | 6·0 | 4·32 |
| 10 | 5·34 | 6·37 | 5·53 | 6·12 | 6·37 | 5·8 |
| 11 | 5·35 | 6·36 | 5·54 | 6·11 | 7·11 | 5·51 |
| 12 | 5·36 | 6·36 | 5·55 | 6·9 | 7·42 | 6·13 |
| 13 | 5·36 | 6·35 | 5·55 | 6·8 | 8·13 | 6·45 |
| 14 | 5·37 | 6·34 | 5·56 | 6·7 | 8·46 | 7·19 |
| 15 | 5·38 | 6·33 | 5·56 | 6·6 | 9·22 | 7·56 |
| 16 | 5·39 | 6·33 | 5·57 | 6·5 | 10·1 | 8·41 |
| 17 | 5·39 | 6·32 | 5·57 | 6·4 | 10·45 | 9·34 |
| 18 | 5·40 | 6·31 | 5·58 | 6·3 | 11·40 | 10·33 |
| 19 | 5·41 | 6·31 | 5·59 | 6·2 | .. | 11·37 |
| 20 | 5·42 | 6·30 | 5·59 | 6·0 | 12·40 | .. |
| | | | | | a.m. | a.m. |
| 21 | 5·42 | 6·29 | 6·0 | 5·59 | 1·44 | 12·42 |
| 22 | 5·43 | 6·29 | 6·0 | 5·58 | 2·50 | 1·48 |
| 23 | 5·44 | 6·28 | 6·1 | 5·57 | 3·56 | 2·51 |
| 24 | 5·45 | 6·27 | 6·1 | 5·56 | 5·1 | 3·52 |
| 25 | 5·45 | 6·25 | 6·2 | 5·54 | 6·2 | 4·50 |
| 26 | 5·46 | 6·24 | 6·2 | 5·53 | 7·1 | 5·45 |
| 27 | 5·47 | 6·23 | 6·3 | 5·52 | 7·57 | 6·40 |
| 28 | 5·48 | 6·22 | 6·4 | 5·50 | 8·53 | 7·37 |
| 29 | .. | .. | 6·4 | 5·49 | .. | 8·33 |
| 30 | .. | .. | 6·5 | 5·48 | .. | 9·30 |
| 31 | .. | .. | 6·5 | 5·47 | .. | 10·24 |

## Phases of the Moon, Occultations, &c.

| | | | |
|---|---|---|---|
| 2 Feb. | ☾ First Quarter | 11 16 p.m. |
| 10 ,, | ○ Full Moon | 11 0 p.m. |
| 18 ,, | ☽ Last Quarter | 12 8 a.m. |
| 24 ,, | ● New Moon | 10 44 p.m. |

Apogee, 4th February, at 7.12 a.m.
Perigee, 18th February, at 8.42 p.m.

The planets Mercury and Saturn will be within 1¼ degree of one another on the 1st of February but too near the sun to be observable. On the 7th Mercury will be passing from west to east of the Sun on the far side of its orbit, but instead of being directly behind the Sun, it will be about 2 degrees south of it.

When the Moon is passing from west to east of Mars, about 1 a.m. on the 13th, there will be a distance of 6 degrees (length of the Southern Cross) between them. Six hours later the Moon will be passing Jupiter, at half the distance given for Mars, in broad daylight.

In the middle of February it will be interesting to look for the rising of the planets Venus and Saturn, which will be in such remarkably close conjunction as to seem only one.

When the Moon overtakes Venus on the 23rd, about 7 p.m., there will be an occultation of that splendid planet, but unfortunately it will occur after they have set and when too near the Sun to be observable.

Of the two eclipses of the Sun which will occur in 1933 the first will be on the 24th instant. This belongs to the other side of the world and will be invisible in Queensland, which, however, will be more fortunate on the second occasion, 21st August.

The path of the Moon during the month will be—In Pisces on the 1st, in Aries on the 2nd and 3rd, in Taurus 4th, 5th, and 6th, in Gemini 7th and 8th, in Cancer 9th, in Leo 10th, 11th, and 12th, in Virgo 13th, 14th, and 15th, in Libra 16th and 17th, in Scorpio and Orphineus 18th and 19th, in Sagittarius 20th and 21st, in Capricornus 22nd and 23rd, in Aquarius 24th and 25th, and again in Pisces 26th, 27th, and 28th.

Mercury will rise only 24 minutes before the Sun on the 1st; it will be in superior conjunction on the 7th; on the 15th it will set 20 minutes after the Sun.

Venus rises at 3.55 a.m. on the 1st and at 4.20 a.m. on the 15th.

Mars rises at 8.52 p.m. on the 1st and at 7.53 p.m. on the 15th. Jupiter rises at 8.51 p.m. on the 1st and at 7.57 p.m. on the 15th. Saturn rises only 19 minutes before the Sun on the 1st; on the 15th it rises at 4.25 a.m

| | | | |
|---|---|---|---|
| 4 Mar. | ☾ First Quarter | 8 23 p.m. |
| 12 ,, | ○ Full Moon | 12 46 p.m. |
| 19 ,, | ☽ Last Quarter | 7 5 a.m. |
| 26 ,, | ● New Moon | 1 20 p.m. |

Apogee, 4th March, at 4.6 a.m.
Perigee, 16th March, at 2.30 a.m.
Apogee, 31st March, at 11.12 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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# QUEENSLAND AGRICULTURAL JOURNAL

Vol. XXXIX. 1 MARCH, 1933. Part 3.

## Event and Comment.

### Greater Production and Less Loss.

FARMERS and graziers in Australia are, in spite of favourable exchange rates, continuing to lose money. It is quite obvious that there can only be one end to their getting further into debt. If their incomes could be increased by forcing up prices, the primary producers' road to prosperity would be as easy to travel as the Pacific highway. But it is impossible to fix the prices of our exportable commodities, and our influence on oversea markets becomes negligible the moment outward cargoes are entered on the ships' manifests. The only sound alternative then is to reduce production costs to the level at least of world's prices. How can it be done? Dr. A. E. V. Richardson (Director of the Waite Agricultural Research Institute in Adelaide and a representative of the Commonwealth at the Ottawa Conference) answers that question in the course of a brief review of the present position of agriculture in Australia. He finds that costs can be lowered not only by tariff adjustment and, perhaps, other forms of political action, but also by increasing yields and avoiding losses by the eradication of diseases and pests. The outstanding feature of the depression, he says, has been the catastrophic fall in the price levels of agricultural products. The fall has been much greater than in manufactured products, returns from interest, gilt-edged securities, and labour.

Some recovery in export prices may be expected to follow from a satisfactory adjustment of international problems, but it is improbable that price levels of the post-war period will be reached again for some time. A substantial and permanent loss of national income to Australia may therefore be expected. To some extent this loss may be recovered by expansion of production, but this can take place economically only when internal costs have been adjusted to the new level of prices of export commodities. Apart from a drop which would follow tariff adjustment and other political action, the application of scientific research to primary production offers one potent means of lowering costs.

The States have attempted to increase production by bringing new lands in areas of light and uncertain rainfall under cultivation. This involved heavy capital outlay for roads, railways, water supply, and for financing settlers. It is doubtful whether

much of this expenditure could be justified economically, even in a period of high export prices. In a time of low export prices and scarcity of long-term loans, such a policy would be impossible.

The alternative is to increase production on settled areas by applying knowledge and finding new scientific methods which will enable further intensification of production.

The most promising avenues for scientific research are analysis of the factors which are responsible for yield with a view to developing more productive varieties of wheat, control of the fungus diseases which exact such heavy annual toll of our wheat crops—take-all and flag smut—with the possible production, by cross-breeding, of strains which are resistant to these diseases, and the elucidation of the fertility problem involved in bare fallowing.

Notwithstanding the expansion of the wheat belt into drier and poorer areas during the past three decades, there has been a consistent increase in the yield per acre, and there is scientific evidence for the belief that in most wheat districts it could be greatly increased before the limits imposed by the rainfall are approached.

The application of scientific methods to the pastoral industries will pave the way for considerable economic development. First, there is the reduction of losses due to disease. In the aggregate millions sterling are lost annually from the ravages of blowfly, liver fluke, caseous lymphadenitis, braxy black disease, and intestinal parasites in sheep, and from tick, worm nodules, pleuro-pneumonia, abortion, and mammitis, &c., in cattle. Progress is being made by the Council for Scientific and Industrial Research in the attack on these diseases.

## Stock Losses through Malnutrition.

A SECOND source of loss, Dr. Richardson adds, is caused by malnutrition of stock. The northern areas of Australia experience summer rainfall, followed by a long dry period in winter. The green herbage grown during the rainy season is highly nutritious, but the dry herbage progressively deteriorates and loses a large portion of its nutritive value, and is abnormally low in protein and minerals.

The division of animal nutrition has demonstrated that the yield of wool may be increased by over 30 per cent. by supplementing the natural pasture with a protein-rich concentrate when the pasture is dry and of low nutritive value.

In other areas mineral deficiencies in the herbage frequently occur. Lack of phosphorus is the chief trouble. In the heavier rainfall regions the deficiency may be overcome by top-dressing the pasture with soluble phosphates or by sowing down improved pastures. In areas of light rainfall, where economic considerations do not permit top-dressing, phosphate deficiency may be corrected by allowing stock free access to mineral licks. The practice of supplementing pastures with mineral licks needs to be placed on a sound basis by ascertaining the mineral deficiencies in each grassland region, and adjusting the composition of the lick to the ascertained deficiencies in the pasture, and to the special needs of the grazing animal.

A promising field for economic expansion, particularly in dairying and fat lamb raising, is the improvement of pastures. Regions of moderate to heavy rainfall, which already carry the bulk of the livestock, are most suited for intensive pasture development. The basic need of the livestock farmer is to obtain the maximum amount of nutritive pasture on his holding. This involves use of the most productive types of pasture plants and the application of methods of management that will maintain them in a good condition.

The systematic introduction and testing of herbage plants from other countries is of great interest to Australia. Perhaps the most important phase of pasture development is the determination of the most productive type for each climatic and soil region in the higher rainfall country, and the methods of manuring and management which will maintain it at a high level of productivity.

Continuing, Dr. Richardson says that recent research has shown that over considerable areas of the better rainfall country (over 25 inches) the carrying capacity may be greatly increased, at an economic cost, by ploughing the natural pasture and sowing permanent grasses and clovers with appropriate fertilizers, and that the productivity can be maintained by proper methods of management. Top-dressing of natural pastures increases the grass in regions of liberal rainfall. This practice has been extensively adopted, but it has limitations, because of the inherently low

productive capacity of the natural species. Recent work has shown that the fertilizers can be used to better effect if more productive species are incorporated into the pasture sward.

The discovery of means of transporting chilled beef from Australia would lead to great developments in the beef industry in Northern Australia and Queensland. Recent work at the low temperature research station at Cambridge on the use of gaseous antiseptics on meat has shown that by a 10 per cent. concentration of carbon dioxide in the atmosphere of a ship's hold the growth of mould is completely inhibited, the fat is unaffected, and the bloom and appearance remain satisfactory even after prolonged periods of storage at chilling temperatures.

One of the most interesting results of large-scale application of scientific research is the reclamation of land in Queensland affected with prickly-pear by the caterpillar, Cactoblastis cactorum.

The dairying industry is ideally suited for intensive production, as it is conducted principally in regions of liberal rainfall and fertile soil, and by a large number of individually small units.

The industry is entering an intensive stage of development, and the output will be largely increased when the present policies of encouraging herd testing, the use of purebred sires, improved methods of feeding, and the elimination of preventable disease, give results.

The carrying capacity of dairy country can be greatly enhanced by the more extensive use of sown pastures and the adoption of appropriate methods of pasture management. This is the direction in which we may look with confidence for a lowering of the costs of production and increasing our competitive power in British markets. The preferential duty of 15s. per cwt. for butter accorded under the Ottawa agreement will further enhance our competitive power against foreign countries.

## Results of the Ottawa Conference.

DISCUSSING some results of the Ottawa Conference, Dr. Richardson contends that under the agreements substantial concessions have been granted by Great Britain for various groups of primary products. Free entry was accorded to dominion products and preferences were granted on a wide range of commodities. These preferential duties should prove of great assistance to Australia in meeting the competition of foreign producers on the British market.

From a dominion point of view the significance of the agreement is that Britain has agreed for five years to maintain preferential duties on a group of primary products, most of which are grown on mixed farms or intensive holdings.

The meat agreement is particularly valuable, because it virtually provides that while foreign supplies of mutton, lamb, and frozen beef will be restricted by 35 per cent. during the next eighteen months, and that foreign supplies of pig products will be substantially reduced, Australia will be able to export practically as much as ever to Britain, and will not be limited in the export of frozen pork. It is expected that the wholesale prices of meat will be substantially increased, and that Australia will benefit mainly by the enhanced prices of the products.

The determination of the United Kingdom to curtail her dependence on foreign imports of bacon and ham and develop a larger pig production locally should provide an excellent opportunity for Australia to play a much more important part in this trade. Natural conditions here are highly suited for pig production, and it is probable that on the irrigation areas of the Murray Valley a combination of grazing pigs on lucerne or irrigated pasture, together with the feeding of barley grown in close proximity, would provide a basis of production for a large export trade in frozen pork for the manufacture in England of bacon and ham.

This brief review suggests, Dr. Richardson says in conclusion, some specific directions in which scientific research can assist primary production. Increasing the output per acre and per animal by the use of the most approved scientific methods offers one sure means of reducing the costs of production per unit.

Future progress of primary production in Australia lies mainly in the intensification and diversification of agricultural production in settled areas of liberal rainfall.

The clear lesson of experience in all great agricultural countries is that a permanent economic expansion in the output from the land, and the power to survive in world competition with agricultural products, is possible only when all the resources of science and invention are applied to the cultivation of the soil and the raising of livestock.

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

### OCCURRENCE OF SECOND AND THIRD-STAGE GRUBS OF "GREYBACK."

By EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

### EXTERNAL INDICATIONS OF ROOT DAMAGE TO CANE STOOLS.

LAST month we saw that second-stage grubs of the greyback cockchafer were chiefly in evidence, although a few representatives of the first larval stage of this beetle could still be met with. Towards the end of March, however, those in the third stage of growth usually prevail, unmistakable indications of their presence in canefields being very clearly betrayed by wilting or death of the heart-leaves.

Widely spread destruction of stools is not generally witnessed, however, until later on, in April and May, throughout which period the economic importance of our so-called cane grub problem may be said to assume a startling significance to all interested in the welfare of the sugar industry.

**Description of the Third-stage Grub.**

Although closely resembling grubs of the second stage in general appearance the fully grown or third-stage larva possesses a few additional distinctive characters, and may be briefly described as follows:—Colour, creamy-white; anal segment or tail-end of body suffused with dark-grey, blue-black, or brown, due to the internal presence and varying colour of the soil being ingested showing through its thin semi-transparent skin. Head, brownish-yellow, edges of "jaws" blackish, shield-like plate on upper surface of first segment adjoining head, light yellow. Body clothed with a few rather long light reddish hairs. Length of body 2½ inches; across doubled up position 1¼ inches. (See life-size photo. of third-stage grub.)

PLATE 22.

Fully grown third-stage Grub of the greyback Cane-Beetle.

PLATE 23.

Arrangement of bristles on anal segment of Grub of greyback Cane-Beetle.

**How to Identify this Grub in a Few Seconds.**

On the lower surface of its last body segment will be seen two central parallel rows of small short reddish spines (about twenty-four in each row), which are partly surrounded by numerous longer scattered bristles (see illustration).

In addition to this curiously arranged vestiture, the width across the head in grubs of the third instar is invariably three-eighths of an inch (never more or less).

The only other root-eating grubs likely to be noticed by growers associated with those of the greyback, although naturally of somewhat similar shape and colour, happen to be of a darker shade of yellow, and also exhibit entirely different arrangements of the bristles occurring on the last body segment.


Plate 24.

Grubs of the "Greyback" Cockchafer under Cane Stools, devouring the larger roots and affecting stability of the Sticks.

**Subterranean Movements of the Mature Grub.**

After its final change of skin, which denotes commencement of the third stage, the newly moulted grub appears of a pale bluish-white colour, and slightly translucent. At this stage, its new coat being rather soft, it eats very little during the next week or so, the skin meanwhile gradually toughening, becoming more opaque, and finally acquiring the normal yellowish-white colour.

**Nature of Damage to Roots and Cane Sticks.**

Some of our growers still seem inclined to believe that long continued dry weather is mainly responsible for severe grub damage; their assumption being that during such periods juicy cane roots are liable to be devoured for the sake of the moisture they contain.

As a matter of fact our greyback cockchafer, although habitually extracting organic matter from soil ingested by it for such purpose, and also consuming a small amount of humus, happens to have a decided liking for living vegetable tissue. Hence its partiality for the succulent roots of sugar-cane, blady grass, &c., and its fondness for the growing cellular tissue of English potatoes, damaged examples of which are often hollowed out by this cane pest; a single large third-stage grey-back grub being not uncommonly found comfortably ensconced and apparently quite at home in a cavity eaten by it in the centre of a large tuber. Moreover, this taste for growing vegetable matter, combined possibly with an acquired fondness for sugar, induces these grubs to gnaw large holes into the centre of actual cane sticks which have attained maturity; this being a form of injury, however, which can be more fittingly discussed next month (April).

The principal damage inflicted by third-stage grubs during March is mainly due to severance and gradual consumption of a large percentage of the main cord-like roots which serve to support the stool and maintain a sufficient water supply. These succulent roots, varying from one-sixteenth to three-sixteenths of an inch thick, are generally bitten through at points ranging from 4 to 8 inches from ground level, the grub often following up a root as far as the base of the affected stool, devouring the juicy tissue as it proceeds.

**When to Commence Fumigation of Greyback Grubs.**

Owing to the first appearance of this cockchafer beetle having occurred towards the end of December, fumigation work on several farms may have to be delayed until about the middle of March. In seasons of such belated beetle emergence, however, we can realise more fully the value of the hand injector, which enables one to fumigate successfully cane stools that by the middle of March have grown too high to admit of the use of horse-machines.

The period occupied by grubs of the second stage of development may be taken as being thirty-eight days, while those of the third stage live for about sixteen weeks before transforming into pupæ. The table below indicates the correct dates on which to commence fumigation of grub-infested soil, and applies to beetle emergences taking place on any date between 16th December to 11th January, thus allowing a period of seventy days between appearance of the adult cockchafer to presence in the soil of third-stage grubs of sufficient size to damage the cane seriously.

WHEN TO FUMIGATE GRUB-INFESTED CANE LAND.

| Beetles Emerge. | Time to Fumigate. | Beetles Emerge. | Time to Fumigate. | Beetles Emerge. | Time to Fumigate. |
|---|---|---|---|---|---|
| Dec. 16 | Feb. 24 | Dec. 25 | Mar. 5 | Jan. 3 | Mar. 14 |
| Dec. 17 | Feb. 25 | Dec. 26 | Mar. 6 | Jan. 4 | Mar. 15 |
| Dec. 18 | Feb. 26 | Dec. 27 | Mar. 7 | Jan. 5 | Mar. 16 |
| Dec. 19 | Feb. 27 | Dec. 28 | Mar. 8 | Jan. 6 | Mar. 17 |
| Dec. 20 | Feb. 28 | Dec. 29 | Mar. 9 | Jan. 7 | Mar. 18 |
| Dec. 21 | Mar. 1 | Dec. 30 | Mar. 10 | Jan. 8 | Mar. 19 |
| Dec. 22 | Mar. 2 | Dec. 31 | Mar. 11 | Jan. 9 | Mar. 20 |
| Dec. 23 | Mar. 3 | Jan. 1 | Mar. 12 | Jan. 10 | Mar. 21 |
| Dec. 24 | Mar. 4 | Jan. 2 | Mar. 13 | Jan. 11 | Mar. 22 |

Our first step is to determine the degree of grub infestation (as described last month in the "Queensland Agricultural Journal") by examining the roots of cane stools situated about one chain apart throughout the area believed to be affected. If obtaining an average of four to eight or more grubs per stool the crop should be fumigated.

The chief points to be remembered in connection with such work may be considered under four headings, viz.:—

(1) Learn how to set and manipulate the hand injector.

(2) Before starting to fumigate, make certain your land is in an "open" or aerated condition.

(3) Inject the proper dose of fumigant at each stroke of the plunger at the correct depth, distance apart, and from the nearest stools in the row being treated.

(4) After each application press your foot on the hole after withdrawing the spear, to close same against escape of any of the fumes.

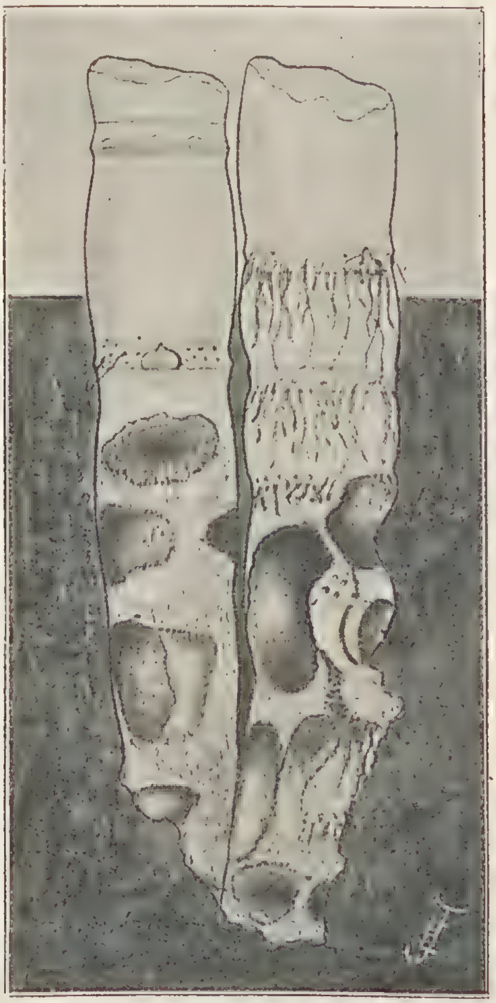

PLATE 25.
Basal portion of cane sticks gnawed by grubs of "Greyback" cane beetles.

Control of our cane grub by means of soil fumigants was described in last month's "Queensland Agricultural Journal," to which the reader is accordingly referred for detailed information.

It should, however, be mentioned here that familiarity with the internal construction of the Danks' hand injector, the one mostly used in our canefields, will often save a loss of much valuable time during field operations. In the event of a pump, for instance, failing to act properly the trouble is generally found to be due to some simple defect, such as a perished washer, dirt in the ball valve, a nut requiring tightening up, or blockage of some delivery passage.

Before starting work see that the foot-rest on the injector is in correct position for releasing the fumigant just above the level at which grubs chance to be feeding at the time; and that the regulator tube at top of the injector be set to No. 5 dose. The amount of carbon bisulphide given at each injection is one-sixth oz.; another favourite dosage being the 1 drachm 20 minims, which is the quantity discharged by Danks' injector when set at No. 5. These injections are usually made 12 inches apart on both sides of a cane row, 3 inches from stools, and 4 to 4½ inches deep, the number of stabs given depending to some extent on the age of the crop, size of the stools, and soil porosity. In certain cases it has been found desirable to give five or even six injections to large stools to ensure best results, this, however, being exceptional. If mixing paradichlorobenzene with carbon bisulphide, 60 lb. of the former are usually dissolved in about 5 gallons of the liquid carrier. This must be stirred well, and when liquified filtered through copper gauze before pouring into the injector.

During the course of fumigation do not forget to examine a few of the treated stools at intervals of a day or two, to note nature of results obtained. Test your injectors also above ground now and then to make sure the doses are being discharged in uniform and correct quantity, and at each stroke of the plunger.

### External Indications of Root Damage.

Towards the end of this month the heart leaves of cane growing on badly grub-infested blocks begin to lose their normal bright green colour and assume a greyish somewhat wilted appearance. At midday, during dry weather, it will be noticed, too, that the blades of central leaves display a tendency to curl over from each side of the midrib, the entire leaf becoming of nearly tubular form. In the next stage of injury this curling of the leaves can often be seen on cloudy or wet days. The above symptoms indicate inability of such affected canes to obtain sufficient water, owing to grubs having severed most of the large main roots. A little later, these central heart leaves soon take on a yellowish colour, which gradually darkens to brown before the final drying up of the cane tops.

The plate for March illustrates second and third stage grubs of our greyback beetle destroying the larger roots of cane plants. Such weakened stools, after losing much of their hold of the ground, are liable to be blown over during wet windy weather.

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# Farm Fertility Trials

and

## REVIEW OF THE WORK OF EXPERIMENT STATIONS.

[CONTINUED.]

### RESULTS FOR THE 1932 SEASON.

*In presenting the results of the Farm Fertility Trials harvested during 1932, advantage is taken of the opportunity to review also the work of the past year on the Northern, Central, and Southern Experiment Stations. The results of plot experiments harvested on these Stations have already been recorded in the Annual Report of the Director, but as certain of them are of special interest, a detailed discussion of their more valuable features is again presented. Attention is directed particularly to those trials which aimed at determining the manurial value of molasses, and the possibilities of irrigation in those areas which are at present dependent on natural rainfall.*

### BURDEKIN DISTRICT.

The results of the farm trials recorded below, provide unmistakeable evidence of the need for added nitrogenous fertilizers on the irrigated soils of this area. The average crop increase due to sulphate of ammonia is 9 tons of cane per acre; in each case the dressing was only 300 lb. of this fertilizer per acre. We are now attempting to determine the economic limit to which the dressings may be increased.

As regards superphosphate and potash, we are again unable to record positive evidence of increases due to the use of these constituents. At the same time it must be remembered that where heavy crops are harvested, it is imperative that the supply of all plant foods be restored in order that the productivity of the land may be maintained.

*Location.*—**B. Tapiolas's farm, Ivanhoe, Ayr.**

*Soil Type.*—Alluvial loam.

*Variety.*—Badila. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

| —— | No Fertiliser. | 300 lb. Sulphate of Ammonia. | 300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate. | 300 lb. Sulphate of Ammonia + 180 lb. Potash. | 300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 180 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 24·3 | 30·3 | 28·5 | 29·1 | 30·5 |
| C.C.S. in cane .. .. .. | 17·4% | 16·4% | 16·6% | 16·9% | 16·4% |
| Value of crop .. .. .. | £55 18 0 | £64 13 0 | £61 16 0 | £64 11 0 | £65 2 0 |
| Less harvesting costs .. .. | £9 6 0 | £11 12 0 | £10 19 0 | £11 3 0 | £11 14 0 |
| Return .. .. .. .. | £46 12 0 | £53 1 0 | £50 17 0 | £53 8 0 | £53 8 0 |
| Increased return due to fertilizer | .. | £6 9 0 | £4 5 0 | £6 16 0 | £6 16 0 |
| Cost of fertilizer and application | .. | £2 0 0 | £2 18 0 | £3 9 0 | £4 7 0 |
| Profit from fertilizer .. .. | .. | £4 9 0 | £1 7 0 | £3 7 0 | £2 9 0 |

*Location.*—**Messrs. Hoey Brothers' farm, Pioneer.**

*Soil Type.*—Old alluvial loam.

*Variety.*—Badila. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

| —— | No Fertilizer. | 300 lb. Sulphate of Ammonia + 360 lb. Super-phosphate. | 300 lb. Sulphate of Ammonia + 180 lb. Potash. | 360 lb. Super-phosphate + 180 lb. Potash. | 300 lb. Sulphate of Ammonia + 360 lb. Super-phosphate + 180lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 7·4 | 15·3 | 17·5 | 6·8 | 18·8 |
| C.C.S. in cane .. .. .. | 17·0% | 17·1% | 17·0% | 17·2% | 17·2% |
| Value of crop .. .. .. | £16 11 0 | £34 9 0 | £39 2 0 | £15 8 0 | £42 13 0 |
| Less harvesting costs .. .. | £4 1 0 | £5 14 0 | £6 10 0 | £4 2 0 | £6 19 0 |
| Return .. .. .. .. | £12 10 0 | £28 15 0 | £32 12 0 | £11 6 0 | £35 14 0 |
| Increased or decreased return due to fertilizer .. .. .. | .. | Increased. £16 5 0 | Increased. £20 2 0 | Decreased. £1 4 0 | Increased. £23 4 0 |
| Cost of fertilizer and application | .. | £3 1 0 | £3 9 0 | £3 1 0 | £4 11 0 |
| Profit or loss from fertilizer .. | .. | Profit. £13 4 0 | Profit. £16 13 0 | Loss. £4 5 0 | Profit. £18 13 0 |

The use of sulphate of ammonia has converted a crop failure into what would be considered a fair ratoon crop in the Burdekin area. In the absence of ammonia, superphosphate and potash showed a complete loss.

*Location.*—**J. Ahern's farm, Airdale.**

*Soil Type.*—Alluvial loam.

*Variety.*—H.Q. 426. Age of crop—Fourteen months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 300 lb. Sulphate of Ammonia + 360 lb. Superphosphate. | 300 lb. Sulphate of Ammonia + 180 lb. Potash. | 360 lb. Superphosphate + 180 lb. Potash. | 300 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 180 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 23·7 | 40·9 | 36·6 | 25·8 | 36·0 |
| C.C.S. in cane .. .. .. | 16·7% | 15·7% | 15·2% | 16·4% | 14·8% |
| Value of crop .. .. .. | £50 4 0 | £82 8 0 | £70 13 0 | £55 1 0 | £67 2 0 |
| Less harvesting costs .. .. | £8 16 0 | £15 3 0 | £13 12 0 | £9 11 0 | £13 7 0 |
| Return .. .. .. .. | £41 8 0 | £67 5 0 | £57 1 0 | £45 10 0 | £53 15 0 |
| Increased return due to fertilizer | .. | £25 17 0 | £15 13 0 | £4 2 0 | £12 7 0 |
| Cost of fertilizer and application | .. | £3 1 0 | £3 9 0 | £3 1 0 | £4 11 0 |
| Profit from fertilizer .. .. | .. | £22 16 0 | £12 4 0 | £1 1 0 | £7 16 0 |

This trial presents unmistakeable evidence of the value of sulphate of ammonia on a plant crop of cane in this area. The c.c.s. values of the fertilized plots are unaccountably erratic, which detracts from the economic gain for the complete manure.

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*Location.*—**S. Gibson's farm, Home Hill.**

*Soil Type.*—Alluvial loam.

*Variety.*—Badila. Age of crop—Eleven months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 300 lb. Sulphate of Ammonia + 360 lb. Superphosphate. | 300 lb. Sulphate of Ammonia + 180 lb. Potash. | 360 lb. Superphosphate + 180 lb. Potash. | 300 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 180 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 11·3 | 20·2 | 18·8 | 12·1 | 20·1 |
| C.C.S. in cane .. .. .. | 15·1% | 14·8% | 15·1% | 15·1% | 14·9% |
| Value of crop .. .. .. | £21 12 0 | £37 13 0 | £35 19 0 | £23 3 0 | £37 16 0 |
| Less harvesting costs .. .. | £4 1 0 | £7 10 0 | £6 19 0 | £4 2 0 | £7 9 0 |
| Return .. .. .. .. | £17 11 0 | £30 3 0 | £29 0 0 | £19 1 0 | £30 7 0 |
| Increased return due to fertilizer | .. | £12 12 0 | £11 9 0 | £1 10 0 | £12 16 0 |
| Cost of fertilizer and application | .. | £3 1 0 | £3 9 0 | £3 1 0 | £4 11 0 |
| Profit or loss from fertilizer .. | .. | Profit. £9 11 0 | Profit. £8 0 0 | Loss. £1 11 0 | Profit. £8 5 0 |

## MACKAY DISTRICT.

The 1931-32 season saw a continuation of the unfavourable growing conditions experienced the previous year. As a consequence all crops were light, and plant cane showed little response to fertilizer. The first ratoon crops also lacked vitality following on a poor plant crop, in general.

*Location.*—**F. D. Pratt's farm, Kolijo.**

*Soil Type.*—Alluvial loam.

*Variety*—H.Q. 426. Age of crop—Twelve months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate. | 300 lb. Sulphate of Ammonia +150 lb. Potash. | 300 lb. Super-phosphate + 150 lb. Potash. | 300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 150 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 13·5 | 16·0 | 17·8 | 13·6 | 16·0 |
| C.C.S. in cane .. .. .. | 14·3% | 14·7% | 13·8% | 14·6% | 13·2% |
| Value of crop .. .. .. | £24 1 0 | £29 11 0 | £30 3 0 | £24 18 0 | £25 10 0 |
| Less harvesting costs .. .. | £5 7 0 | £5 19 0 | £6 12 0 | £5 8 0 | £5 19 0 |
| Return .. .. .. .. | £18 14 0 | £23 12 0 | £23 11 0 | £19 10 0 | £19 11 0 |
| Increased return due to fertilizer | .. | £4 18 0 | £4 17 0 | £0 16 0 | £0 17 0 |
| Cost of fertilizer and application | .. | £2 17 0 | £3 3 0 | £2 11 0 | £4 1 0 |
| Profit or loss from fertilizer .. | .. | Profit. £2 1 0 | Profit. £1 14 0 | Loss. £1 15 0 | Loss. £3 4 0 |

There are very definite indications in these results that sulphate of ammonia may be used to advantage on the richer alluvial soils of the North Coast area. This would apply with particular force to ratoon crops.

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*Location.*—**A. J. Watt's farm, Kuttabul.**

*Soil Type.*—Acid loam from sedimentary rock.

*Variety.*—M. 1900. Age of crop—Fourteen months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate. | 240 lb. Sulphate of Ammonia + 180 lb. Potash. | 360 lb. Super-phosphate + 180 lb. Potash. | 240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate + 180 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 11·8 | 15·1 | 12·9 | 15·5 | 16·0 |
| C.C.S. in cane .. .. .. | 15·2% | 15·1% | 14·7% | 15·3% | 14·6% |
| Value of crop .. .. .. | £22 15 0 | £28 18 0 | £23 17 0 | £30 4 0 | £29 6 0 |
| Less harvesting costs .. .. | £5 5 0 | £5 12 0 | £5 9 0 | £5 15 0 | £5 19 0 |
| Return .. .. .. .. | £17 10 0 | £23 6 0 | £18 8 0 | £24 9 0 | £23 7 0 |
| Increased return due to fertilizer | .. | £5 16 0 | £0 18 0 | £6 19 0 | £5 17 0 |
| Cost of fertilizer and application | .. | £2 15 0 | £3 2 0 | £3 0 0 | £4 3 0 |
| Profit or loss from fertilizer .. | .. | Profit. £3 1 0 | Loss. £2 4 0 | Profit. £3 19 0 | Profit. £1 14 0 |

A general response to nitrogen, phosphoric acid, and potash is in evidence here. Soils of this type certainly require heavy fertilizer dressings to restore them to a state of high fertility. In common with most highly acid soils, the response to superphosphate was particularly marked.

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*Location.*—**P. Hand's farm, Wandaru.**

*Soil Type.*—Stony hillside loam.

*Variety.*—M. 1900. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 240 lb. Superphosphate. | 240 lb. Sulphate of Ammonia + 120 lb. Potash. | 240 lb. Superphosphate + 120 lb. Potash. | 240 lb. Sulphate of Ammonia + 240 lb. Superphosphate + 120 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 8·4 | 11·0 | 10·2 | 11·6 | 12·9 |
| C.C.S. in cane .. .. .. | 16·3% | 16·1% | 16·3% | 16·9% | 16·7% |
| Value of crop .. .. .. | £17 16 0 | £22 18 0 | £21 12 0 | £25 15 0 | £28 4 0 |
| Less harvesting costs .. .. | £4 8 0 | £4 18 0 | £4 13 0 | £5 3 0 | £5 9 0 |
| Return .. .. .. .. .. | £13 8 0 | £18 0 0 | £16 19 0 | £20 12 0 | £22 15 0 |
| Increased return due to fertilizer | .. | £4 12 0 | £3 11 0 | £7 4 0 | £9 7 0 |
| Cost of fertilizer and application | .. | £2 8 0 | £2 13 0 | £2 4 0 | £3 7 0 |
| Profit from fertilizer .. .. | .. | £2 4 0 | £0 18 0 | £5 0 0 | £6 0 0 |

Though little evidence of the value of fertilizer was noted on the plant cane, the ratoon crop showed a general response, particularly with regard to superphosphate.

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*Location.*—**F. Letchford's farm, Finch Hatton.**

*Soil Type.*—Sandy loam, outwash soil.

*Variety.*—M. 1900. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 200 lb. Sulphate of Ammonia + 250 lb. Superphosphate. | 200 lb. Sulphate of Ammonia + 125 lb. Potash. | 250 lb. Superphosphate + 125 lb. Potash. | 200 lb. Sulphate of Ammonia + 250 lb. Superphosphate + 125 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 9·8 | 9·7 | 10·6 | 9·3 | 10·6 |
| C.C.S. in cane .. .. .. | 17·5% | 16·2% | 17·4% | 17·2% | 16·9% |
| Value of crop .. .. .. | £22 14 0 | £20 7 0 | £24 8 0 | £21 2 0 | £23 10 0 |
| Less harvesting costs .. .. | £4 18 0 | £4 17 0 | £4 16 0 | £4 13 0 | £4 16 0 |
| Return .. .. .. .. .. | £17 16 0 | £15 10 0 | £19 12 0 | £16 9 0 | £18 14 0 |
| Increased or decreased return due to fertilizer .. .. .. | .. | Decreased. £2 6 0 | Increased. £1 16 0 | Decreased. £1 7 0 | Increased. £0 18 0 |
| Cost of fertilizer and application | .. | £2 4 0 | £2 10 0 | £2 5 0 | £3 4 0 |
| Loss from fertilizer .. .. | .. | £4 10 0 | £0 14 0 | £3 12 0 | £2 6 0 |

*Location.*—**P. H. McLean's farm, Pinnacle.**

*Soil Type.*—Alluvial loam.

*Variety.*—H.Q. 426. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 280 lb. Sulphate of Ammonia + 280 lb. Superphosphate. | 280 lb. Sulphate of Ammonia + 140 lb. Potash. | 280 lb. Superphosphate + 140 lb. Potash. | 280 lb. Sulphate of Ammonia + 280 lb. Superphosphate + 140 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 14·4 | 22·0 | 20·2 | 14·4 | 22·1 |
| C.C.S. in cane .. .. .. | 14·1% | 14·0% | 13·7% | 13·8% | 13·7% |
| Value of crop .. .. .. | £25 3 0 | £38 1 0 | £33 18 0 | £24 8 0 | £37 1 0 |
| Less harvesting costs .. .. | £5 10 0 | £8 3 0 | £7 10 0 | £5 10 0 | £8 4 0 |
| Return .. .. .. .. | £19 13 0 | £29 18 0 | £26 8 0 | £18 18 0 | £28 17 0 |
| Increased or decreased return due to fertilizer .. .. .. | .. | Increased. £10 5 0 | Increased. £6 15 0 | Decreased. £0 15 0 | Increased. £9 4 0 |
| Cost of fertilizer and application | .. | £2 14 0 | £3 0 0 | £2 9 0 | £3 17 0 |
| Profit or loss from fertilizer .. | .. | Profit. £7 11 0 | Profit. £3 15 0 | Loss. £3 4 0 | Profit. £5 7 0 |

These results are interesting in that they indicate the decided value of sulphate of ammonia for ratoon crops on the rich alluvial soils of this area. The increased yield for a modest 280 lb. of sulphate of ammonia suggests that the dressings could be increased quite profitably.

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*Location.*—**H. Barfield's farm, Tannalo.**

*Soil Type.*—Alluvial loam.

*Variety.*—E.K. 28. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 225 lb. Sulphate of Ammonia + 300 lb. Superphosphate. | 225 lb. Sulphate of Ammonia + 120 lb. Potash. | 300 lb. Superphosphate + 120 lb. Potash. | 225 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 120 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 11·0 | 16·4 | 15·8 | 12·1 | 16·5 |
| C.C.S. in cane .. .. .. | 14·1% | 13·8% | 13·7% | 13·9% | 13·3% |
| Value of crop .. .. .. | £19 4 0 | £27 16 0 | £26 10 0 | £20 14 0 | £26 11 0 |
| Less harvesting costs .. .. | £4 18 0 | £6 2 0 | £5 17 0 | £5 2 0 | £6 2 0 |
| Return .. .. .. .. | £14 6 0 | £21 14 0 | £20 13 0 | £15 12 0 | £20 9 0 |
| Increased return due to fertilizer | .. | £7 8 0 | £6 7 0 | £1 6 0 | £6 3 0 |
| Cost of fertilizer and application | .. | £2 9 0 | £2 11 0 | £2 6 0 | £3 8 0 |
| Profit or loss from fertilizer .. | .. | Profit. £4 19 0 | Profit. £3 16 0 | Loss. £1 0 0 | Profit. £2 15 0 |

Again the value of sulphate of ammonia is in evidence on this crop of first ratoons.

*Location.*—**B. F. Hogan's farm, Mia Mia, North Eton.**

*Soil Type.*—Alluvial loam.

*Variety.*—E.K. 28. Age of crop—Fifteen months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 300 lb. Sulphate of Ammonia + 300 lb. Superphosphate. | 300 lb. Sulphate of Ammonia + 200 lb. Potash. | 300 lb. Superphosphate + 200 lb. Potash. | 300 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 200 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre | 31·9 | 33·7 | 34·5 | 32·6 | 34·4 |
| C.C.S. in cane | 15·4% | 14·8% | 14·5% | 14·6% | 14·4% |
| Value of crop | £62 13 0 | £62 17 0 | £62 11 0 | £59 13 0 | £61 16 0 |
| Less harvesting costs | £11 17 0 | £12 10 0 | £12 16 0 | £12 2 0 | £12 15 0 |
| Return | £50 16 0 | £50 7 0 | £49 15 0 | £47 11 0 | £49 1 0 |
| Increased or decreased return due to fertilizer | .. | Decreased. £0 9 0 | Decreased. £1 1 0 | Decreased. £3 5 0 | Decreased. £1 15 0 |
| Cost of fertilizer and application | .. | £2 17 0 | £3 11 0 | £2 19 0 | £4 8 0 |
| Loss from fertilizer | .. | £3 6 0 | £4 12 0 | £6 4 0 | £6 3 0 |

Fertilizers containing nitrogen appear to have effected a slight—though definite—increase in cane yield on this soil. All treatments recorded a loss, however, due largely to the depressed c.c.s. value where fertilizer was applied. Had the crop been normally matured at harvest time it is probable that the adverse influence would have been eliminated.

*Location.*—**Branscombe Plantation, Palms Estate, Pleystowe.**

*Soil Type.*—Alluvial loam.

*Variety.*—Q. 813. Age of crop—Ten months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 240 lb. Superphosphate. | 240 lb Sulphate of Ammonia + 120 lb. Potash. | 240 lb. Superphosphate + 120 lb. Potash. | 240 lb. Sulphate of Ammonia + 240 lb. Superphospate. + 120 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre | 4·8 | 6·3 | 7·5 | 5·9 | 7·0 |
| C.C.S. in cane | 14·0% | 14·2% | 14·7% | 14·2% | 14·2% |
| Value of crop | £8 6 0 | £11 2 0 | £13 17 0 | £10 8 0 | £12 7 0 |
| Less harvesting costs | £3 2 0 | £3 6 0 | £3 10 0 | £3 17 0 | £3 5 0 |
| Return | £5 4 0 | £7 16 0 | £10 7 0 | £6 11 0 | £9 2 0 |
| Increased return due to fertilizer | .. | £2 12 0 | £5 3 0 | £1 7 0 | £3 18 0 |
| Cost of fertilizer and application | .. | £2 8 0 | £2 13 0 | £2 3 0 | £3 7 0 |
| Profit or loss from fertilizer | .. | Profit. £0 4 0 | Profit. £2 10 0 | Loss. £0 16 0 | Profit. £0 11 0 |

*Location.*—**C. H. Miles's farm, Te Kowai.**

*Soil Type.*—Alluvial loam.

*Variety.*—P.O.J. 2714. Age of crop—Eleven months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 300 lb. Super-phosphate. | 240 lb. Sulphate of Ammonia + 120 lb. Potash. | 300 lb. Super-phosphate + 120 lb. Potash. | 240 lb. Sulphate of Ammonia + 300 lb Super-phosphate + 120lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per care .. .. | 9·0 | 12·1 | 14·0 | 10·1 | 13·5 |
| C.C.S. in cane .. .. | 15·1% | 14·3% | 15·0% | 14·9% | 15·0% |
| Value of crop .. .. .. | £17 1 0 | £21 11 0 | £26 11 0 | £19 0 0 | £25 12 0 |
| Less harvesting costs .. .. | £4 10 0 | £5 0 0 | £5 7 0 | £4 8 0 | £5 6 0 |
| Return .. .. .. .. .. | £12 11 0 | £16 11 0 | £21 4 0 | £14 12 0 | £20 0 0 |
| Increased return due to fertilizer | .. | £4 0 0 | £8 13 0 | £2 1 0 | £7 15 0 |
| Cost of fertilizer and application | .. | £2 11 0 | £2 13 0 | £2 6 0 | £3 10 0 |
| Profit or loss from fertilizer .. | .. | Profit. £1 9 0 | Profit. £6 0 0 | Loss. £0 5 0 | Profit. £3 5 0 |

Nitrogenous fertilizer has again produced results under adverse conditions, where superphosphate and potash have given little or no result. Our knowledge of the plant food content of this land shows, however, that this type of soil is in need of these plant foods to build up its fertility.

## SOUTHERN DISTRICTS.

The unprecedented drought conditions which prevailed in the Bundaberg and Maryborough areas resulted in an almost complete crop failure. In no case were the trial blocks fit to harvest as such, and many were allowed to standover. The only trials recorded herewith are those from the Maroochy River area, Nambour, where light rains at critical periods resulted in fair crops in that district.

*Location.*—**J. W. Tatnell's farm, Maroochy River.**

*Soil Type.*—Alluvial loam; better class soil of the district.

*Variety.*—Q. 813. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

| — | No Fertilizer. | 240 lb. Sulphate of Ammonia + 320 lb. Super-phosphate. | 240 lb. Sulphate of Ammonia + 128 lb. Potash. | 320 lb. Super-phosphate + 128 lb. Potash. | 240 lb. Sulphate of Ammonia + 320 lb. Super-phosphate + 128 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 14·7 | 18·2 | 18·8 | 17·6 | 18·8 |
| C.C.S. in cane .. .. .. | 15·4% | 15·3% | 15·3% | 15·2% | 15·6% |
| Value of crop .. .. .. | £28 17 0 | £35 9 0 | £36 12 0 | £33 19 0 | £37 11 0 |
| Less harvesting costs .. .. | £5 9 0 | £6 10 0 | £6 15 0 | £6 6 0 | £6 15 0 |
| Return .. .. .. .. .. | £23 8 0 | £28 19 0 | £29 17 0 | £27 13 0 | £30 16 0 |
| Increased return due to fertilizer | .. | £5 11 0 | £6 9 0 | £4 5 0 | £7 8 0 |
| Cost of fertilizer and application | .. | £2 15 0 | £2 16 0 | £2 11 0 | £3 15 0 |
| Profit from fertilizer .. .. | .. | £2 16 0 | £3 13 0 | £1 14 0 | £3 13 0 |

The plots this year showed a general increase from the use of artificial manures, but it is not possible to state which particular plant food was in greatest demand. In all cases a net profit was shown.

*Location.*—**W. Niemi's farm, Maroochy River.**

*Soil Type.*—Alluvial loam, wet clay subsoil.

*Variety.*—Q. 813. Age of crop—Thirteen and a-half months. Nature of crop—Plant cane.

RESULTS.

| — | No Fertilizer. | 180 lb. Sulphate of Ammonia + 420 lb. Superphosphate. | 180 lb. Sulphate of Ammonia + 180 lb. Potash. | 420 lb. Superphosphate + 180 lb. Potash. | 180 lb. Sulphate of Ammonia + 420 lb. Superphosphate + 180 lb. Potash. |
|---|---|---|---|---|---|
| Tons cane per acre .. .. | 18·7 | 22·3 | 19·7 | 21·5 | 22·9 |
| Value of crop .. .. .. | £34 12 0 | £41 5 0 | £36 9 0 | £39 16 0 | £42 7 0 |
| Less harvesting costs .. .. | £6 14 0 | £8 0 0 | £7 1 0 | £7 14 0 | £8 4 0 |
| Return .. .. .. .. | £27 18 0 | £33 5 0 | £29 8 0 | £32 2 0 | £34 3 0 |
| Increased return due to fertilizer | .. | £5 7 0 | £1 10 0 | £4 4 0 | £6 5 0 |
| Cost of fertilizer and application | .. | £2 15 0 | £2 19 0 | £3 5 0 | £4 4 0 |
| Profit or loss from fertilizer .. | .. | Profit. £2 12 0 | Loss. £1 9 0 | Profit. £0 19 0 | Profit. £2 1 0 |

This area was found to be decidedly acid, and it received a dressing of lime prior to planting. Consistent with previous experience on acid soils, the increased yield due to superphosphate was marked.

## QUEENSLAND SHOW DATES, 1933.

Clifton: 1st and 2nd March.
Allora: 8th and 9th March.
Pittsworth: 14th and 15th March.
Goombungee: 23rd March.
Killarney: 24th and 25th March.
Toowoomba: 27th to 30th March.
Beaudesert Camp Draft: 30th March to 1st April.
Dalby: 5th and 6th April.
Beenleigh Camp Draft: 8th April.
Oakey: 8th April.
Sydney Royal: 10th to 19th April.
Chinchilla: 11th and 12th April.
Boonah Camp Draft: 15th to 17th April.
Miles: 19th April.
Nanango: 20th and 21st April.
Tara: 26th April.
Kingaroy: 27th and 28th April.
Goondiwindi Camp Draft and Show: 28th and 29th April.
Taroom: Camp Draft 1st, Show 2nd and 3rd May.
Boonah: 3rd and 4th May.
Monto: 3rd and 4th May.
Wondai: 4th and 5th May.
Blackall: 9th and 11th May.
Beaudesert: 10th and 11th May.
Mundubbera: 10th and 11th May.
Murgon: 11th and 13th May.
Ipswich: 16th to 19th May.
Gayndah: 17th and 18th May.
Mitchell: 17th and 18th May.
Goomeri: 18th and 19th May.
Kilkivan: 22nd and 23rd May.
Gympie: 24th and 25th May. Camp Draft: 27th.
Toogoolawah: 26th and 27th May.
Kalbar: 27th May.
Maryborough: 30th May to 1st June.
Marburg: 2nd and 3rd June.
Wowan: 8th and 9th June.
Lowood: 9th and 10th June.
Gladstone: 14th and 15th June.
Rockhampton: 20th to 24th June.
Mackay: 27th to 29th June.
Laidley: 28th and 29th June.
Gatton: 5th and 6th July.
Caboolture: 13th and 14th July.
Rosewood: 14th and 15th July.
Nambour: 19th and 20th July.
Ayr: 21st and 22nd July.
Esk: 21st and 22nd July.
Maleny: 26th and 27th July.
Pine Rivers: 29th July.
Royal National: 7th to 12th August.
Crow's Nest: 23rd and 24th August.
Nerang: 13th October.

# Timber Borers.

By ROBERT VEITCH, B.Sc., F.E.S., Chief Entomologist.

THE very extensive use of timber for the construction of dwelling-houses and the smaller type of business premises in Queensland is frequently associated with a degree of borer infestation that is at least of decided interest, and sometimes of considerable importance to many property owners in this State. The species commonly associated with wooden buildings are four in number, and are of varying degrees of importance; two are of little consequence, the third is moderately important, while the fourth is decidedly so and is capable of inflicting severe losses.

Many property owners are unaware of the relative importance of the different species, and quite needless anxiety is frequently caused by the discovery of the tunnels of the unimportant species. It therefore seems desirable to briefly indicate the habits of all four species of borers, and to discuss the reasons for their varying importance. Control measures will be recommended where such are deemed necessary.

Perhaps the best procedure is to take the species in the order in which they will be encountered in the life of a building. The first species in such a sequence is the shot hole borer or ambrosia beetle, the tunnels of which will be found in the timber before it is worked into the building.

## The Shot Hole Borer.

Shot hole borers leave traces of their tunnelling in practically every wooden building in Queensland, one of the commonest species being that known as *Platypus omnivorus* Lea. This species may be regarded as typical of the shot hole borers in Queensland, and, like other shot hole borers, it is of no importance in so far as the stability of the structure is concerned, although it is one of the two abovementioned species which frequently cause quite unnecessary anxiety.

The adults of the common shot hole borer are very small, dark reddish brown, cylindrical beetles, measuring about an eighth of an inch in length. They attack living trees in poor condition as well as newly felled logs, and will even infest the green timber sawn into boards and stacked for seasoning. Quite definitely, however, they will not attack seasoned timber worked into a building. Hence the number of shot holes observed in the timber when the building is being erected represents the final total from this type of borer attack. The presence of the tunnels, which are generally very straight and are about the diameter of small shot (Plate 26), does not in any way indicate the commencement of borer infestation, as is frequently thought to be the case. These tunnels merely indicate where the ambrosia beetles or shot hole borers have been at work, but their work is over for good so far as that timber is concerned.

The explanation of the cessation of infestation in the case of this species is at once apparent on reference to the generally accepted theory as to the feeding habits of the shot hole borers. The reader will note that the term ambrosia beetle was used as one of the two common names for this species of borer, and he may also remember that the ancient Greeks believed immortality was conferred on anyone who ate the food

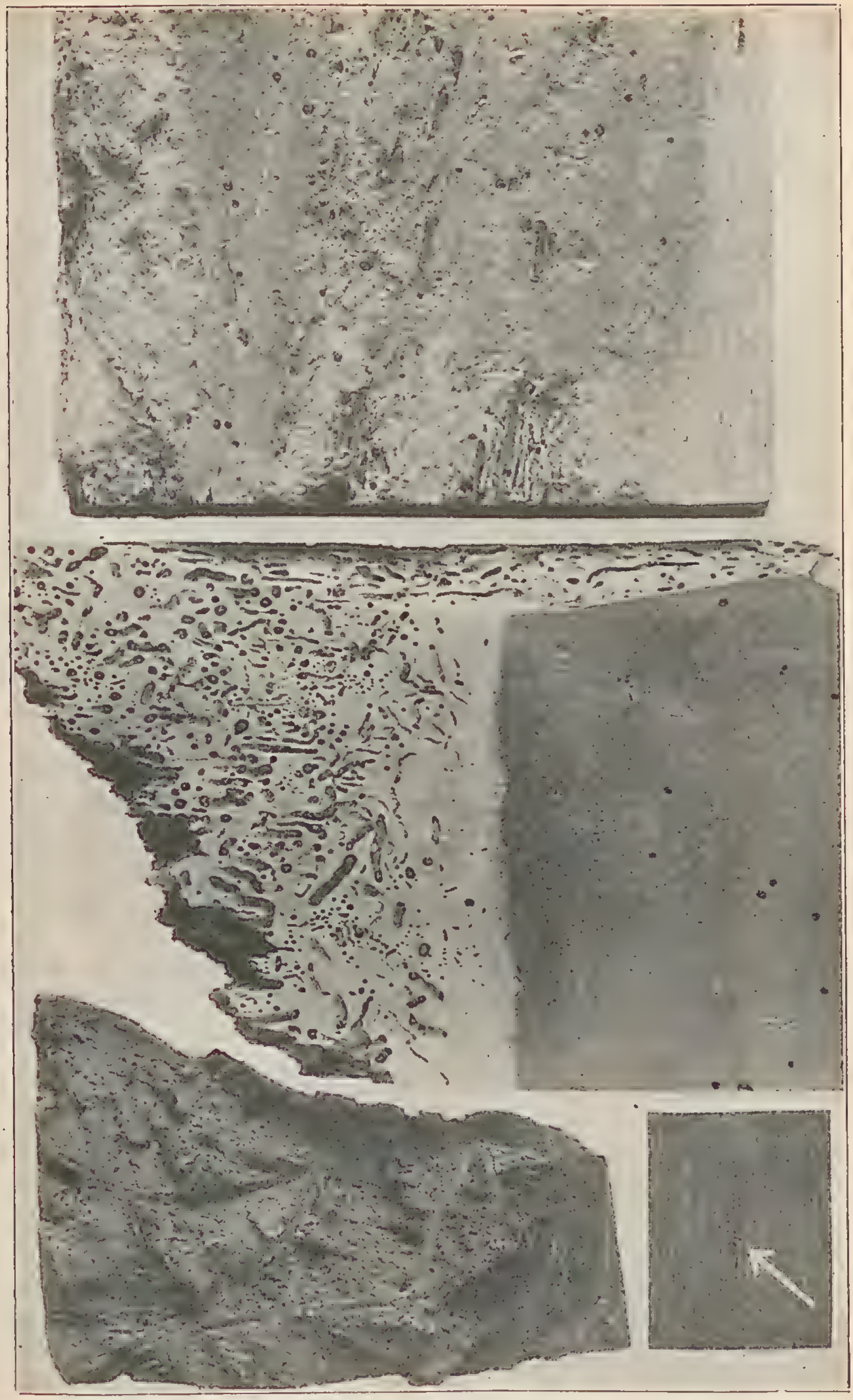

PLATE 26.

Top: Hardwood showing sapwood damaged by the powder-post beetle. Note the powder-filled larval tunnels, and the flight holes of the beetles.

Centre: Pine lining board damaged by Queensland furniture beetle. Note the meandering larval tunnels and the flight holes of the beetles on the outer surface.

Bottom Left: Fragment of hardwood showing damage by shot-hole borer. Note the straighter, fungus-stained tunnels.

Bottom Right: Outer surface of previous, showing entrance hole. Note the discolouration immediately around the hole due to fungal infection.

of the gods, which they called ambrosia. By a series of transitions, the word ambrosia is now used to designate anything pleasant to taste or smell, and it has eventually become associated with the group of beetles under discussion on account of their peculiar feeding habits.

The peculiarity in this case is that, although the beetles are frequently present in great numbers in moist timber and logs, they do not feed on the wood. What actually happens is that the beetles bore into the moist wood, and on the walls of their very narrow tunnels there grows a fungus on which the beetles and their larvæ feed. As the sap dries out, the growth of the fungus ceases and the beetles move elsewhere, while the larvæ which have not then become fully grown naturally perish. The beetles, driven from the drying timber by the gradual diminution of the supply of the fungus, almost invariably carry spores of the fungus with them when they migrate, and these spores germinate and produce a fresh supply of food in the tunnels in the new logs.

It should, therefore, be obvious that the shot hole borer or ambrosia beetle cannot possibly go on breeding in a building. The presence of its old tunnels is therefore at worst a slight blemish, which in no way affects the stability of the building. The walls of these tunnels, when cut by the saw, are frequently seen to be slightly stained as a result of the presence of the associated fungus, but this is a matter of no consequence.

### The Hoop Pine Beetle.

Attention must now be directed to a borer of an entirely different type—namely, the hoop pine beetle. This species (*Prospheres aurantiopictus* L. & G.) is very much larger and broader than the ambrosia beetle, being about two-thirds of an inch in length. The general colour of the beetle is black, broken by four transverse rows of golden yellow spots. It belongs to the family of large, brilliantly coloured insects very appropriately known as the jewel beetles.

The beetles belonging to this species lay their eggs in newly felled logs in the forest, and in many cases the larvæ hatching from these eggs complete their development in the timber when it is sawn up and built into a dwelling-house. The full-grown larvæ transform to pupæ, which in their turn give rise to the beetles. These beetles emerge from the infested boards by eating holes in the surface of the timber, the diameter of the holes being about the same as that of a lead pencil (Plate 27). The emergence of the beetles from the pine timber often does not take place until a year or eighteen months after the building has been erected. The presence of a number of these flight holes not unnaturally creates a considerable measure of anxiety in the mind of the owner, who sometimes visualises his house crumbling away in premature decay.

As in the case of the shot hole borer or ambrosia beetle, there is, however, no cause for anxiety, although the exit holes are admittedly disfiguring. The beetles will not lay their eggs in the seasoned timber of the building, for their egg-laying activities are restricted to newly felled logs.

### The Powder Post Beetle.

As has been indicated, neither the ambrosia beetle nor the hoop pine beetle need cause the property owner any anxiety. Furthermore, control measures in so far as the buildings are concerned are not called for in either case.

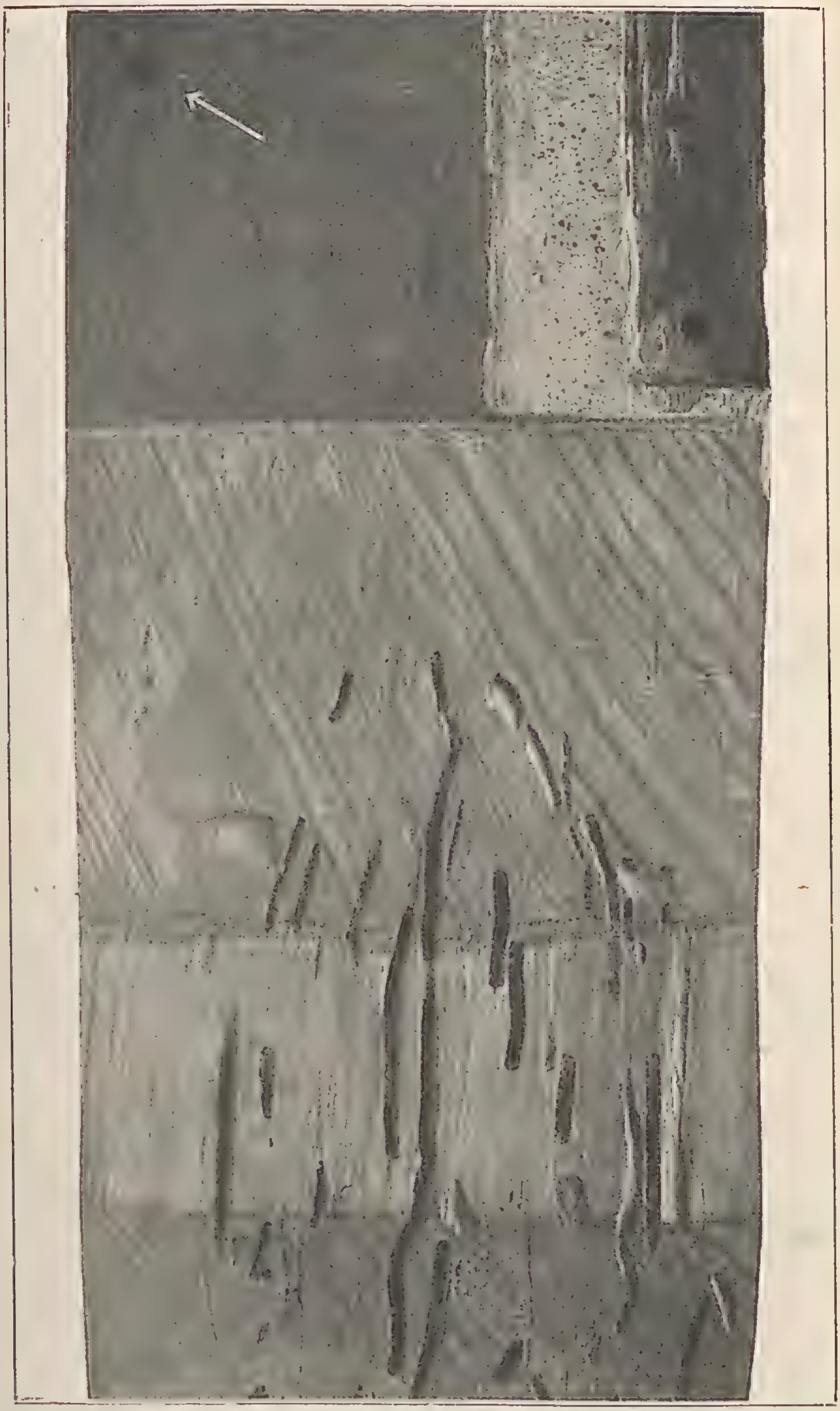

Plate 27.

Pine timber, with oblique cuts, showing damage by the hoop-pine beetle. Note the flat larval tunnels and the flight hole of the beetle. (Flight hole indicated by arrow.)

The third species in the sequence is, however, of considerably greater importance, and is commonly known as the powder post beetle (*Lyctus brunneus* Stephens). This species is a small, somewhat flat, reddish brown beetle measuring about one-sixth of an inch in length. It lays its eggs in the sapwood of logs and sawn timber in the timber yard, but, according to W. W. Froggatt, infestation of timber does not take place until it is at least partially seasoned, say eight months or so after it has been sawn.

Its presence is generally noticed about eighteen months after the erection of the building, and is indicated by very small heaps of wood débris so fine in texture as to be appropriately referred to as powder or dust, hence the common name, powder post beetle. These tiny heaps will be found beneath the very small pin holes (Plate 26) made by the insects, and their presence and the texture of the powder or dust serves to distinguish this species from other borers likely to be encountered in Queensland buildings.

Several points are of importance in considering the status of this insect as a pest. In the first place it differs markedly from the shot hole borer and the hoop pine beetle in that it will go on breeding year after year until it reduces the infested portion of the timber to a crumbling mass that can readily be broken under light pressure. This may sound somewhat alarming, but for two reasons the position is not really very serious; firstly, the powder post beetle does not attack pine timber, its depredations being confined entirely to hardwoods; secondly, in hardwoods it attacks only the sapwood, the heartwood being immune. It will thus be seen that in a wooden building only a relatively small proportion of the timber is liable to infestation.

In Queensland the activities of this pest will be noticed chiefly in the stumps underneath the buildings. These frequently contain a proportion of sapwood, which will form an excellent breeding ground for the powder post beetle. Obviously this pest will be completely controlled by eliminating sapwood in hardwood timbers used in building. Such action is by no means universally taken; and as the sapwood in many of the timbers is well worthy of retention, its elimination merely to control the powder post beetle is hardly justified.

If, however, the house posts are painted with creosote or a mixture of creosote and kerosene in equal proportions, it will be found that the infestation is greatly diminished, if not entirely eliminated. Subsequent treatments may, however, be necessary. Creosote or creosote and kerosene in equal proportions can be applied only to stumps and to other parts of the building where staining is of no consequence. Where exposed hardwood flooring or other boards have to be treated and staining would be objectionable, the creosote will have to be heavily diluted by the addition of kerosene until the stain produced by the creosote in the mixture is of no consequence. The dilution may have to be as high as one part of creosote to eight of kerosene. The best procedure is to test the diluted mixture on a small piece of board of the same timber as that to be treated, and if the stain left is negligible, then the treatment of the boards may be proceeded with.

### The Furniture Beetle.

The last insect to which reference will be made is the so-called furniture beetle (*Calymmaderus incisus* Lea), which is really the most serious of the four. Even in this case, however, there are certain compensations, for this species does not appear until a house has been built for quite a number of years. Most cases of infestation coming under the notice of this Department are of buildings erected for fifteen years or more, although in some cases the furniture beetle was undoubtedly present at an earlier date.

In discussing the powder post beetle, it was indicated that infestation frequently commenced while the moisture content of the logs or boards was still fairly high. In the case of the furniture beetle, however, the moisture content is evidently very low when the timber becomes attractive; hence its appearance only in older buildings.

The Queensland furniture beetle is a very small, dark brown insect about one-twelfth of an inch in length. It honeycombs infested timber (Plate 26); thereby producing débris in its tunnels which is much coarser in texture than the flour-like substance associated with the powder post beetle. Unlike the powder post beetle it attacks hoop pine and is present in both the sapwood and heartwood.

It goes on breeding year after year; and will eventually impair the stability of a building. In this connection it may be mentioned that pine floors are not infrequently so badly riddled where control of this pest is neglected that the boards break under the weight of heavy articles of furniture. The measures for its control are similar to those recommended in the case of the powder post beetle.

The European furniture beetle is quite distinct from the Queensland furniture beetle, the former being a species of *Anobium*. The nature of the attack, however, is somewhat similar.

### Summary.

To summarise: When a house is being built, a number of small shot holes will probably be noticed in the timber, both of pine and hardwoods; these, however, may be ignored in so far as the stability of the building is concerned. After the elapse of about a year, large black beetles with golden yellow spots may emerge from the pine boards. These, however, will die without reinfesting the timber, and generally they occur in such small numbers as to be of very little consequence. Their emergence holes can be plugged up with putty, thus obscuring the blemishes. In about eighteen months after erection, the powder post beetle will show up in the sapwood of hardwood timber, but it can be controlled by painting the infested timber with creosote or a mixture of creosote and kerosene in equal proportions where staining is of no consequence. Where staining of the timbers is undesirable, the creosote will have to be very heavily diluted by the addition of kerosene so that no objectionable stain will be left on the treated boards. Finally, in old houses the pine timber in many cases will be attacked by the furniture beetle, which can be dealt with in a manner similar to that recommended for the control of the powder post beetle.

# FRUIT GROWING IN NORTH QUEENSLAND.

*The Secretary for Agriculture and Stock, Mr. F. W. Bulcock, M.L.A., has made available the following report by Mr. H. J. Freeman on the Fruit Industry of North Queensland.*

## CITRUS.

OCTOBER and November being particularly dry, resulted in the greater portion of the early blooms failing to set. Luckily, most of the trees bloomed a second time; some of this fruit setting, but the greater portion falling to the ground when the fruit was no larger than an ordinary pea. December rains produced even a third crop of blossom, and aided by the much-needed moisture practically every one of the flowers set, and if the weather conditions throughout the next three months remain favourable, a reasonably satisfactory crop should be harvested in due course.

From observations made, I should estimate that the grower irrigating his orchard during the early part of November, will be more than compensated for his trouble by the price that he will receive for his early maturing fruit, as the bulk of the Southern crop will be four to six weeks later than it was last year.

The present position of the citrus fruit in North Queensland is such that I would again voice my opinion regarding valuable possibilities for the opening up of some of this Northern land and entering into citrus growing on quite a big scale. As mentioned in my previous reports, capital would be required, but in addition to capital, a thorough knowledge of the requirements of the Southern markets, coupled with the latest information regarding favourable varieties of trees and the treating of various pests and diseases, and particularly the efficient artificial colouring of the early fruit, would undoubtedly prove the means of making a decent income.

With the area of land that is available at present, it is indeed remarkable that practically every case of citrus fruit produced in North Queensland is used to satisfy a few small local markets between Townsville and Cooktown, especially when this district allows us the wonderful privilege of picking sweet fruit from the trees, under ordinary conditions, early in March.

### Pineapples.

During October, November, and December a large crop of pines was harvested locally, and very satisfactory prices were returned; the dry weather resulted in some of the ''roughs'' being undersized, but suited the ''smooth'' variety inasmuch as they were much smaller than usual, and so met with a better demand than they would have done under ordinary circumstances. (Under ordinary growing conditions in North Queensland, ''smooths'' are far too large, and the sale of them is seriously affected.) Of the consignments forwarded South, the returns were satisfactory, but the local price was such that most of the growers were quite content to supply the local market.

### Granadillas.

Throughout the past three months, granadillas have been particularly scarce, and the dry weather during October and November had the result of killing out a large number of vines. Farmers wishing to plant out fresh stock were sadly disappointed, for the plantings prior to the December rains were rank failures in almost every case. Of the few that were marketed, a brown fungus spot caused serious disfigurement, and it was only the scarcity of the fruit that created the price per dozen recorded each week in my diary.

### Passion Fruit.

This fruit has also been very scare throughout the past three months, but as often mentioned previously, when granadillas can be obtained, the loss of passion fruit is of little consequence. Just prior to Christmas, a particularly keen demand existed and one grower on the Russell River received 8s. to 10s. per quarter case, for as much fruit as he could possibly gather off his small area. I am of the opinion that it would be essential if a guaranteed crop of passions were required, that regular sprayings with Bordeaux mixture would be imperative as far as North Queensland is concerned.

**Papaws.**

As far as this splendid fruit is concerned, one cannot do other than repeat one's previous views each quarter. As far as Cairns is concerned, there appears to be a never-ending supply of papaws, and the demand remains practically the same throughout the whole of the year. The pity is that growers do not strive to grow a better variety than some of them possess at present, especially when seeds or young seedlings of really first-class quality are so easily procurable.

**Tomatoes.**

Dry weather and lack of sufficient irrigation played a serious part in reducing local supplies of tomatoes. When it is considered that during the driest months, diseases and pests generally are at the lowest ebb, it is indeed very unfortunate that some effort greater than that displayed throughout the local areas, was not adopted as far as irrigation was concerned.

The belief among the Chinese in the Northern districts is that during the wet season it is impossible to satisfactorily grow tomatoes in these areas, and though this may be true to a certain extent, it is mainly because these people do not understand the value of spraying that they make many of the statements attributed to them. Certain it is that, during the drier months, the best crops can be obtained if sufficient moisture were made available by some method of irrigation, and irrespective of what season of the year one harvested one's tomatoes, provided the production was not increased outside of all proportions, a ready sale would always be made throughout the North.

To my mind, tomatoes are allied to citrus, inasmuch as this Northern area possesses opportunities for the production of both these fruits, to a far greater extent than at present is accurately realised.

**Bananas.**

Were is possible to eliminate the effect of Thrip and fly and to lessen to some extent the result of Leafspot and Root Rot, the distance from the Southern markets would not be such a serious matter, but with all these combined, and in the majority of cases very little available finance, the Northern grower is certainly fighting a hard battle right through the year. New plantations must be planted, if only to supply the local markets with good fruit, but no greater quantity would be required for this purpose, and an average price of 3s. to 5s. for first-class bunches would be a fair estimate as far as any prospective planter is concerned. To even obtain clean plants is quite a difficult matter these times, and it was my unfortunate experience to have to condemn 500 plants, that were supposed to be selected for a special order, quite recently.

**Deciduous Fruits.**

Although the recognised wet season of January, February, and March is decidedly detrimental to the harvesting of the deciduous crop anywhere on the Northern tablelands, it still would appear possible, that by planting early varieties and forcing these to the greatest extent between the 1st September and the first or second week in December, remuneration sufficiently satisfactory to warrant this class of farming should be obtained. During my recent visit to the Herberton district I witnessed Kelsey plums of excellent flavour and size being sold from a small orchard at Wondecla, and there is no reason to doubt that were these orchards four times as large, no difficulty would have been experienced in disposing of this fruit. It would appear that deciduous growers throughout the Tableland areas have never seriously contemplated making fruit growing their sole means of livelihood, and as a consequence, the necessary study of varieties or marketing conditions or even cultivation and hygiene treatment of their orchards has never appeared to them to be a very serious matter. A small Red plum, particularly hardy in its growth, appears to be highly suitable in every way to the Tableland area, and matures early and sells well locally. This plum was originally sold under the name of "Precious," and although it appears to be one of the Japanese variety, nothing very concrete is known regarding its origin.

For some reason, apricots and Burbank plums, although covered in blossoms, did not set their fruit this year, and as a result of the repeated failure of the Burbanks to produce a crop in the Tableland area, it is my intention to work several of these trees over with Kelsey buds, during the month of February this year.

In this district the need for irrigation is most apparent, for most of the land is in a dry and unworkable state for July to December each year, and it is only that these growers are not compelled to make their livelihood from this source, that the installation of such an absolute necessity as an irrigation plant has not been installed by them years ago.

Various inquiries were received during December from Cairns fruitgrowers, regarding the possibility of obtaining supplies of deciduous fruits from the Northern Tablelands, but the quantity offering in each case was such that the local requirements necessitated its immediate sale in areas adjacent to where it was grown. I am firmly of the opinion that a splendid opportunity offers, were one to enter into the growing of plums, to supply the existing markets situated between Cairns and Townsville, especially when one had the opportunity of viewing the fruit forwarded from the South, and seeing repeatedly the very bad condition in which it arrives.

## THE EMPIRE'S BEST BUTTERS.

### SCIENTIFIC VERDICT FOR AUSTRALIA.

ONCE again scientists have brought their knowledge into the realm of everyday things. They have recently experimented with a commodity necessary to every household, and have found that the vitamin value of Australian and New Zealand butters is as great as that of the best home-grown summer butter. The details and results of the scientific investigation (made possible through the aid of the Empire Marketing Board) are available in a report issued by the Medical Research Council on the ''Vitamin Content of Australian, New Zealand, and English Butters.'' The findings in this report should do much to increase the sale of Australian butter in the United Kingdom.

The prominence given to-day to food values and the vitamin contents of foodstuffs, coupled with the fact that Britain must obtain some of her supplies from overseas, emphasises the importance of knowing that those which come from far-distant Dominions can be accepted alongside the best that can be produced at home. This especially affects butter which possesses the two fat-soluble vitamins A and D. Vitamin A is essential to growth and helps resistance to disease, whilst vitamin D (the rickets-preventing factor) is necessary for the formation of strong bone and good teeth. The presence of these accessory food factors in butter makes it a most valuable food for children and gives it a place among the preventive medicines, for it forms a regular item in the normal person's diet.

The tested butters have been subjected to a rigid examination, beginning with a study of the cows supplying the cream, of the conditions under which they have been living, of the treatment of the cream and details of every process involved from the time when the butter left the farms in the Dominion until its arrival in England. To estimate the vitamin content tests were made with rats, whose previous family record was available. Two groups were used, the members of one being fed on an ordinary diet, the others receiving food from which vitamin A had been excluded. The rats on the restricted diet lost their glossy coats; their energy and their weight declined; some even developed disease. Their impoverished condition was arrested by daily doses of butter, and the ailing animals began to put on weight and to recover their spirits. Experiments were also carried out which demonstrated the presence of vitamin D and its necessity to the healthy life of the rats.

**Cold Storage no Detriment.**

The vitamins in the butters were also found to have remarkable stability during cold storage. The value of the vitamin content was tested soon after the butters arrived in England. The results were considered together with the information given about the state of the butters when they were first graded and packed, and no appreciable difference in the vitamin potency of the samples was found to exist. The same butters were tested after they had been in cold storage for at least two years, and even after that length of time the general conclusion was justified that no notable depreciation of food value had taken place. These experiments—so satisfactory in their results—demonstrate clearly that the Dominion butters suffer no ill effects during the two or three months which customarily elapse between the time of their production and of their consumption.

The butters subjected to this rigid scrutiny were prepared from mixed breeds and Jersey cows, which had been on open pasture throughout the year. The racial origin of the cows appeared to be without significant effect on the vitamin content.

### Value for Growing Children.

This scientific investigation of the food value of certain butters and its eminently satisfactory results, is of great assistance to the housewife. Anxious for the well-being of those in her care, especially eager that the children should be strong-limbed and healthy, that they should be freed from the ills attendant on dental decay. she will take particular care that her supplies of butter—an item ever on her shopping list—should be those for which positive proof has been adduced as to its richness in the very substances which will aid her in her health campaign.

### The Winter Market in Britain.

A perusal of the Report of the Medical Research Council leaves no doubt of the thoroughness with which the Australian and New Zealand butters have been examined. They have been provided by herds having the benefit of long hours of sunshine in the Southern hemisphere. It is known that the vitamin content of milk and butter produced in Northern countries during the winter months suffers considerably from insufficient sunlight, and from the necessity of stall-feeding for the cows. The importance, therefore, of being able to procure through the winter butter which is as rich in food value as the best English summer butter and as that prepared from the cream of cows fed with food especially rich in fat soluble vitamins, is very great.

The Empire Marketing Board has made it possible for scientists to demonstrate that the Dominion butters have a high and uniform vitamin potency which persists despite differences in methods of production and difficulties of transport. This news is particularly welcome to the British people, for it enables them to obtain excellent Empire butter in winter as well as in summer.

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## MILK INSURANCE.

L. VERNEY, Dairy Inspector.

RATHER a strange title for a note on dairying practice, but feeding a dry cow is an insurance against next year's low yield, and nothing else. The great majority of dairy farmers seem to think that when a cow is dry she does not need any special attention in feeding. This is a big mistake, because it is just as important to feed a good cow when she is dry as it is to feed her what she needs when in milk. The conclusion arrived at after many conversations with dairy farmers is that the dry cow, not being revenue-producing, is looked upon as a nuisance among the cows in milk; and also that a dry cow costs money to feed and maintain. They evidently do not appreciate the fact that nothing on four legs is nearer perpetual motion than the cow, either milking or dry. It must be thoroughly understood that the dry cow is doing three very important things for herself, her owner, and the dairying industry—building up the calf's body, storing up fresh tissue within her own body to draw upon when she freshens, and maintaining her own health. It is quite certain that water and dry grass will not do these things, and if a cow gets nothing else than water and dry grass the flow of milk when she freshens will soon diminish, and likewise the profits. In a newly-freshened cow the supply of milk is fairly good; when without any apparent reason the supply slackens off instead of keeping up for some months, you have silent evidence that she was not given the feed she should have had when dry. It must be thoroughly understood that the cow builds up her wornout body tissues, builds up flesh, blood, and bone of her unborn calf, and also makes the milk she gives from the feed that is given to her. If a cow is a heavy milker she makes great demands on the reserved nutrients and minerals stored in her body, and these can only be placed there by feeding. During the time she is dry she uses the feed she eats for body building and development of her unborn calf, but if you neglect to feed her during the dry period, it is the cow that goes short, but not the calf. In consequence, the cow calves in poor condition, and has no reserves to draw upon. It can be seen from this that the cow that is fed while dry lays up a reserve store of flesh and she has that to draw upon for some weeks after freshening. This will enable her to come to her full flow at about the time the cow that was not fed when dry begins to go off in her milk. The dry cow should be looked upon as a prospective milker and not as a nuisance. But is she? Where good pasturage is obtainable light feeding only is necessary, but on no account should she be allowed to approach the period of exhausting labour in a low or indifferent condition.

## AGRICULTURE ON THE AIR.

### Radio Lectures on Rural Subjects.

ARRANGEMENTS have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 3rd January, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers.

Following is a list, continued from the February Journal, of lectures arranged:—

SCHEDULE OF LECTURES.
BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK.
RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Thursday, 1st June, 1933—"Remarks on Manure and Manuring." D. H. Gurney, Senior Analyst.

Tuesday, 6th June, 1933—"Chicken Rearing." P. Rumball, Poultry Expert.

Thursday, 8th June, 1933—"Incubation." J. J. McLachlan, Poultry Inspector.

Tuesday, 13th June, 1933—"The History of Economic Entomology in Australia." Robert Veitch, B.Sc., F.E.S., Chief Entomologist.

Thursday, 15th June, 1933—"Establishing an Orchard." H. J. Barnes, Instructor in Fruit Culture.

Tuesday, 20th June, 1933—"Fiji Disease of Sugar Cane." A. F. Bell, Pathologist, Bureau of Sugar Experiment Stations.

Thursday, 22nd June, 1933—"Ratooning of Sugar Cane." H. W. Kerr, Agriculturist, Bureau of Sugar Experiment Stations.

Tuesday, 27th June, 1933—"Leaf Scald Disease of Sugar Cane." A. F. Bell, Pathologist, Bureau of Sugar Experiment Stations.

Thursday, 29th June, 1933—"Irrigation in Relation to Cane Production." H. W. Kerr, Agriculturist, Bureau of Sugar Experiment Stations.

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## DAD ON THE TESTS.

I reckon (said Dad) that the country's pests
Is this here wireless and these here tests,
Up to the house and round the door,
Stretchin' their ears for to catch the score,
Leavin the horses down in the crop:
Can you wonder a farmer goes off pop?
I'm yellin' at Jim or I'm cursin' at Joe,
All hours of the day; but it ain't no go—
Leavin' their work, and hangin' around,
When they think I'm down on the fallow ground:
Sneaking away when I start to rouse,
An', as soon as me back's turned, back to the house.
"How goes Wyatt? Is Sutcliffe out?"
What do they care if I rave and shout?
Bribin' young Bill for to leave his job,
To twiddle the switches an' twist the knob.
"Has he made his century? Who's in now?"
And I bought that machine for the price of a cow!
There's a standing crop, an' the rain's not far,
An' the price is rotten, and there you are:
As soon as these cricketin' games begin,
The farm goes dilly on listenin' in;
Not only the boys and the harvester crew,
But Mum an' the girls gits dotty too.
An' I reckon (said Dad) that a man's worst pests
Is this here *wireless* an' these here *tests*.

# Answers to Correspondents.

## BOTANY.

### Milk Weed.

N.R.M. (Goovigen)—

The specimens belong to the Milk Weed, *Euphorbia Drummondii.* Much controversy is centred around the question as to whether this plant is poisonous or not. Even feeding tests have not proved decisive. However, the plant has been found at times to contain a prussic acid-yielding glucoside. It has been observed by stockowners that sheep feeding on this plant developed a pronounced swelling of the head and neck. As Dr. Herbert, when Government Botanist in Western Australia, found this to be a symptom of guinea pigs fed on the plant, it seems obvious that the species under some conditions is definitely harmful, and perhaps fatal. This swelling of the head and neck may not be connected with the effects of the prussic acid generated during digestion from the plant. Usually prussic acid poisoning does not exhibit such a characteristic symptom.

### Giant Paspalum.

T.K. (Feluga, N.Q.)—

The specimen is *Paspalum Urvillei,* sometimes called Giant Paspalum. This grass is propagated either by seeds or by division of the clumps. Seed would have to be ordered under the name of *Paspalum virgatum,* as under that designation it is listed by most seedsmen. However, we now know the proper name is *Paspalum Urvillei.* This grass has been in cultivation in Queensland for a number of years, but has never taken on to the same extent as ordinary Paspalum, *Paspalum dilatatum.* We should think, however, that for a locality such as yours Giant Paspalum would be the better of the two.

### Wild Millet.

E.T.F. (Kilcoy)—

The specimen is *Echinochloa Crus-Galli,* commonly known as Wild Millet or Barnyard Grass. In one form or another this grass is very widely spread over the warmer parts of the world, and several forms of it occur in Queensland. It is quite a good fodder, and is generally regarded as one of the wild parents of such well-known cultivated fodders as Japanese Millet and White Panicum.

### Milk-tainting and other Plants

J.A.O'N. (Gayndah)—

Your specimens have been determined as follows:—

1. *Chenopodium carinatum,* a species of Goosefoot. This is a member of the Saltbush family and would taint milk if eaten in any quantity, but I have never seen stock eat it to any extent.
2. *Geranium dissectum.* Quite a good fodder. I do not know that this plant would taint milk at all other than the taint given by most herbs.
3. *Lepidium ruderale,* the Pepper Cress. Commonly called Mustard Weed, though this vernacular is applied in Queensland to a number of plants of the same family, Cruciferæ. It is very abundant in pastures, and is one of the worst milk-tainting weeds we possess.
4. *Glycine tabacina,* a native legume, and a rather valuable constituent of the average native mixed pasture. It is very common, but I have never heard a local name applied to it.
5. *Eurycles Cunninghamii,* a native plant allied to the Lilies; moderately common in some localities. Its properties are not known, but the plant is not generally eaten by stock, or at least not to any extent.
6. *Tetragonia expansa,* New Zealand Spinach. This might give a weedy or herbage taste to milk if eaten in any quantity, but we have no particular knowledge of it in this respect.
7. *Digitaria marginata,* the common Summer Grass.

### Broad-leaved Carpet Grass.

A.J.C. (Cooroy)—

The specimen is *Paspalum platycaule*, the Broad-leaved Carpet Grass. This grass is a native of the warmer parts of America, but is now spread over the tropical and subtropical regions of the world. It is fairly common in coastal Queensland, having been established in the North for many years. More recently it has made its way south, and is generally regarded as a useful fodder for places where better-class grasses, such as ordinary Paspalum and Rhodes, will not thrive. The grass has its limitations, but is quite useful for growing on much of our coastal second-class country.

### Phalaris Minor.

C.H. (Proston)—

The specimen is *Phalaris minor*, an annual Phalaris, but a valuable fodder either as green feed or hay.

### Grasses Identified.

C.T. (Palmwoods)—

The specimens of grass are as follows:—

1. *Cynodon dactylon* (Couch Grass), a good grass for the dairy farm.
2. *Sporobolus berteroanus* (Wire Grass), an inferior grass which is becoming a pest on some North Coast farms. I think it would be advisable for you to grub out this grass.
3. *Axonopus compressus* (Broad-leaved Carpet Grass). I would also suggest that this grass be eradicated if it is spreading over a paspalum pasture, as the Broad-leaved Carpet Grass is decidedly inferior to ordinary paspalum.
4. Probably *Digitaria didactyla* (Blue Couch), though it is impossible to say definitely in the absence of seed heads. Blue couch is a fairly useful grass on a dairy farm, although on the whole it is not such a good grass as paspalum, as it does not stand dry weather. It may run out blady grass which is fed down by stock.

### Native Plumbago—Whitewood.

J.H.McC. (Hughenden)—

1. We doubt if any of the specimens forwarded are responsible for the losses referred to. We are also doubtful if poisonous plants are the cause of the trouble, but if this is so we would advise you to look for the Native Plumbago, *Plumbago zeylanica*, a shrub usually growing about 3 feet high with a bluish or dirty white flower. This shrub commonly grows as undergrowth on low wooded hills and is readily trimmed by stock. It was recorded some years ago in the neighbourhood of Julia Creek as being the cause of deaths in pregnant ewes, the trouble extending over a considerable period.
2. *Atalaya hemiglauca*, Whitewood. Whitewood has, as you know, been proved by feeding tests to cause staggers or shivers in stock, and to be at least one cause of the Kimberley Horse Disease and probably the Gilbert River trouble as well.

### The Blind Snake.

A.B. (Mundubbera)—

Mr. Heber A. Longman, Director of the Queensland Museum, advises that the mummified snake sent by you for identification is a species of blind snake, known technically as *Typhlops polygrammicus* Schlegel. These are true snakes, but they belong to a special family, the Typhlopidæ, the members of which are subterranean in habits. They are quite harmless, and they feed on small insects and their larvæ and ants' eggs. The eyes are very degenerate. The body scales are very smooth, and except that the tail ends in a tiny point it is difficult to distinguish this from the head end. There are no fangs, and the few teeth are confined to the upper jaw and are very tiny. This species is widely distributed in Queensland, and is not uncommon in places. It grows to over 2 ft. in length, and is one of the largest species of blind snakes.

# General Notes.

## Stanthorpe Fruit and Vegetable Levy.

A Regulation has been approved under the Fruit Marketing Organisation Acts, extending the Stanthorpe Fruit and Vegetable Levy Regulations for a further period of twelve months.

These Regulations were issued in December, 1930, for twelve months, and extended for a similar period in December, 1931. They empower the Committee of Direction of Fruit Marketing to make a levy on growers of all fruit and vegetables grown in the district situated within a radius of 40 miles from Wallangarra, and railed from any railway station from Wallangarra to Dalveen, both inclusive, and from Amiens to Fleurbaix, both inclusive.

The levy is at the rate of 10d. per ton, and is payable to the Commissioner for Railways at the time of railing the various consignments. The amount raised by the levy is expended in payment of expenses incurred in the collection of the levy, and for administrative purposes, which latter amount is credited to the Deciduous Sectional Group Committee.

## Sense of Duty.

"Our young people must be given the opportunity to learn to rule, always remembering that 'he who ruleth his spirit is greater than he that taketh a city,'" declared Mr. F. W. Bulcock (Minister for Agriculture and Stock), in an address in a city church recently.

To be able to examine oneself critically was being made more and more essential by the stress and turmoil of modern life, said Mr. Bulcock. Self-examination, facing the good and bad facts of their personalities, would enable them to see more clearly their aim in life and to go on towards that aim. The youth of to-day would be the rulers of to-morrow, and the aims and aspirations of the youth of to-day would become the aims of the nation to-morrow. It was necessary for them to learn to be "hard" on themselves, to live as their highest ideal of duty indicated.

The word "duty" was the most sublime word in the English language. "No matter how difficult the task that is set us, we must go through with it to the end," said the speaker. "Duty may be for the State, the community, or for the individual, but duty to self must be attained first, then to the family, then the community and the State. Each individual must act decently, think quickly, and give of his very best to the rest. There have been changes in the conception of duty. Our heroes of old—knights and the great sea rovers—were, we realise only marauders, but they discharged what seemed to them to be their duty. We have learned that wrong done with a good motive is not good; we see duty more clearly.

"The present world position is based on selfishness—nation against nation, individual against individual. We have competition and rivalry, while the world cries for brotherhood and unselfish service. To serve the people, irrespective of personal gain, and to ascertain how much one can give, rather than get, is an idea worth striving for. From duty comes happiness and good, and these represent the beauty of life, and where there is beauty created there is the divine vision, for God is beauty as well as love."

## Barley Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts which will provide that the members of the Barley Board elected in 1933 shall hold office from 24th April, 1933, to the 30th September, 1934, and those elected in the year 1935 shall hold office until April, 1937.

The Barley Pool Board was constituted on the 24th April, 1930, for a period of seven years, and the members of the Board are elected annually. The present Board's term of office expires in April next, and the Board are desirous that the time of election should coincide with the beginning and completion of the work entrusted to it in the finalisation of the marketing of the commodity. This period extends roughly from 1st October to the end of September, and the Order in Council issued to-day will bring the term of the Board within the desired period, those elected in October, 1935, however, continuing until the Pool expires in April, 1937.

### Sanctuaries.

An Order in Council has been issued under the Animals and Birds Acts declaring the Molle Group Islands, Hayman Island, and the Double Cone Islands, all situated in Whitsunday Passage, to be sanctuaries under and for the purposes of the abovementioned Acts. It will now be unlawful for any person to take or kill any animal or bird on these islands.

In connection with these sanctuaries, Messrs. W. D. K. MacGillivray and E. M. Embury, Ornithologist and General Organiser, respectively, of the Great Barrier Reef and Whitsunday Passage Biological Station, and also Mr. E. F. Pollock, the Organiser of the Barrier Reef Expedition, have been appointed Honorary Rangers under the Acts.

### An Appreciation of the Department.

Thus the ''Townsville Bulletin'' of 13th December:—''Illustrating the readiness of the Department of Agriculture and Stock to render assistance to enquirers, when preparing data for the article on mango budding and grafting in this issue, Zan wrote to the Under Secretary asking for any information available on the subject. The obliging officers of the Department forwarded a series of articles, some of them going as far back as 1900, covering a wide range of information. It is with pleasure that this courtesy is acknowledged.''

### Tobacco Growers and the Excise Law.

With the great influx of new growers into the tobacco-growing industry in recent years, it is possible that some are not fully conversant with what is required under the Commonwealth Tobacco Excise Law. In the first place registration (for which no fee is charged) is necessary, a £20 penalty being provided for those who neglect this obligation. Leaf may be grown only on the areas in respect of which the grower is registered. The owner or the lessee of the land is the proper person to be registered—share-farmers or partners are covered if the owner or the lessee be registered. Application forms are obtainable from the Collector of Customs.

A grower may store his leaf on his own premises, but not elsewhere without the Collector's permission. A registered grower may sell leaf of his own production only. He is not permitted to buy leaf from any other person, and may sell leaf only to licensed dealers and manufacturers. No person other than a registered dealer or a licensed manufacturer may trade in leaf. A grower must keep an account of all leaf produced and disposed of, and must furnish a return setting out his operations up to 30th June each year. This return must be forwarded to the Collector of Customs not later than 15th July following. Total failure of a crop must be notified in the return. A grower who ceases to grow must at once notify the Collector or continue to furnish annual returns.

No person other than a licensed manufacturer is permitted to prepare tobacco for smoking, under a penalty of £100. Hence, a grower or any other person who prepares tobacco, even for his own smoking, renders himself liable to a heavy fine. Heavy penalties are prescribed for failure to conform to the law in any of the foregoing matters.

### Provisional Maize Board.

Executive approval was given to-day to the issue of an Order in Council amending the constitution of the Provisional Maize Board to provide that such Board shall operate for a period of two years instead of one year.

The Provisional Maize Non-marketing Board was constituted in October, 1931, and applied to all maize grown in Queensland, except that grown on the Atherton Tableland. Until such Board is empowered by Order in Council, subject to an affirmative vote of the growers, to undertake marketing functions, the Board shall not be a marketing board.

The Board consists of a representative of growers from the Moreton district, one from the Darling Downs, one from the Burnett, together with the Director of Marketing, the Chairman of the Executive Committee of the Council of Agriculture, and, when necessary, a representative of the Atherton Tableland Maize Board.

The functions of the Board, amongst other things, consist of arranging with produce merchants and agents with a view of improving existing marketing conditions; arranging for the submission of marketing proposals to growers at a time considered opportune, and conducting such organising arrangements as may be considered desirable to ensure the acceptance of same by growers, and taking action to improve the conditions of growers pending the application of control to the marketing of the commodity.

# Rural Topics.

## Heat Apoplexy in Pigs.

It is unlikely that heat apoplexy will occur among pigs at any time, other than during hot weather, or as a result of abnormal exertion by the animal, whether fat or not. Death often results from such an attack. During the early stages the animal is considerably distressed, and is in a feverish condition. Later it reaches a comatose stage, and will be found stretched out as though already dead. The final struggle is a prolonged one, but the animal does not then appear to be in great pain. Similar symptoms may be noticed because of other afflictions such as severe constipation, and in each case observation will assist in determining the nature of the illness. In a case of snake bite death is usually sudden, and the symptoms are not as pronounced, although partial paralysis may set in at an early stage. It is sometimes possible in these cases to note severe inflammation at the spot attacked by the snake. This would probably be on an exposed portion of the pig's body where the skin is thin and easily punctured. Few pigs, however, die from snake bite, for they appear to understand the habits of the reptile, and keep away from their enemy. In cases of this and like description there is a tendency by the animal to hide, and there is also a loss of appetite. It is difficult to recommend treatment for snake bite, for there are few instances in which it is possible to determine definitely that the trouble is due to snake bite. Similarly, it is difficult to treat an animal for apoplexy, but in both cases strong stimulants are helpful. Keeping the pigs in a reasonably cool condition during hot weather, providing them with ample supplies of clean drinking water, and with succulent green food is strongly recommended in preference to treating animals that have already sickened and have probably passed beyond human aid before the trouble is noticed.

## Constipation in Pigs.

In severe cases of constipation, particularly in breeding sows close to farrowing, and in cases where the trouble has been prolonged and immediate bowel action is necessary, a powder consisting of 5 grains of calomel and one teaspoonful of sugar should be prepared and be mixed in a small ball of moistened pollard and fed to the animal early in the morning, while still hungry. Rolling the ball of pollard in table salt before giving it to the pig will very often induce the animal to take it readily when otherwise it might refuse food. Compel the animal to take plenty of exercise a few hours after giving the calomel, and follow this treatment up by giving 2 oz. of Epsom salts in a small quantity of food or fresh milk. It is essential in cases like this to be sure that the bowels are cleansed of accumulations of dung, otherwise ill-health will continue, and the animal will have little or no desire for food. Feeding the affected animal on light, nutritious, appetising rations in which there is a good supply of green lucerne, pumpkins, sweet potatoes, skim milk, or similar foods, is advised. Little grain is required, but plenty of clean drinking water should be allowed. On the third day of treatment add to the food one dessertspoonful of finely powdered Nauru phosphate and 10 grains of boracic acid, this to sweeten up the stomach and put the animal in better heart. The drugs in powdered form should be mixed with a small quantity of meal and then be moistened to a paste, and finally be added to the food. Continue this treatment for fourteen days in cases where the animal has been very ill.

## Grease better than Oil for the Farm Implements.

An exchange informs us that grease is better than oil for protecting farm implements, buckets, &c., from rust when they are stored after use. Grease stays where it is put, whereas oil often runs off.

## A Thought for the Itchy pig.

In common with all other animals, pigs are often tormented by flies and lice to such an extent that they can have no peace, and instead of lying down and sleeping comfortably, they are restless and continually getting up and down. The trouble can largely be prevented by giving the pigs a daily dressing—only a very small quantity need be used—of petroleum jelly or carbolised vaseline. This will not only help to keep the pests at bay, but will also act as an antidote to fly stings, cuts, and bruises. Though the pig has a tough skin, flies bite, mosquitoes sting, and lice suck the blood. All three tend to reduce the animal's resistance to diseases and check its growth.

## Care of Harness.

Harness perishes very quickly if neglected, but if reasonable care is exercised it will last for years. Plated harness should not be kept in the stables, as the gases arising from the decomposition of the excreta tarnish the fittings. Immediately the harness is brought in the dust should be carefully wiped off with a soft cloth or leather, and mud or sweat removed by washing with water, but on no account should too much be used. The bits should be well washed in clean water, thoroughly dried, and rubbed over with a little neatsfoot oil. The leather should be kept soft and pliable by using some dressing, of which there are a number of cheap and satisfactory commercial preparations.

Heavy harness does not require the same attention, but it must be kept pliable and tough by oiling at regular intervals. Leather which is not treated soon becomes hard under our dry conditions, and cracks, while the stitching decays. A very suitable dressing is pure neatsfoot oil. Some very effective and cheap mixtures are on the market for dressing heavy harness.

## Silage and Grass—Relative Feeding Values.

The question is frequently asked: Is silage equal in feeding value to green grass? It must be said at once that silage is not equal to an ordinary mixed pasturage, though it is a very good substitute. Mixed pasture, on a fairly good soil, is almost ideal feed, as it is made up of many kinds of true grasses, legumes, and other herbs. It is therefore fairly well balanced in regard to protein and carbohydrates, and is also extremely palatable, which is an important feature. Pastures made up entirely of one kind of grass, such as those of the coast, where paspalum has possession, are not entirely satisfactory owing to the lack of variety.

As a rule, silage is made from one crop only—generally either maize, sorghum, or winter cereals, and as these are weak in protein the silage is somewhat deficient in that very important food constituent. For this reason it has been found economical to add concentrates when feeding. Silage will maintain stock in good condition without the admixture of other feeds, but much better results are obtained by using with it such foods as bran, pollard, oilcake, or lucerne hay.—"A. and P. Notes," New South Wales Department of Agriculture.

## When to Feed-off Millet.

Millet should be allowed to attain a height of at least 6 inches before it is fed off. After it has been well eaten down the stock should be removed until another growth is made, which, under favourable conditions, should be only a matter of days.

When the majority of the seed-heads or panicles have formed in the green pendulous stage is the correct time to cut for green fodder. It is better to err on the side of greenness, though millet cut too green has a laxative effect on stock; if too ripe there is a possibility of the feed becoming unpalatable.

The green crop contains much moisture in both stalks and foliage, and in consequence takes longer to cure than ordinary wheaten hay. If the crop is intended for silage, it may stand a little longer after heading out, but it must be cut prior to ripening.—*A. and P. Notes, N.S.W. Dept. Agric.*

## Be Kind to the Cow.

One of the duties a dairy farmer too often neglects is to train his boys how to milk properly. To begin with, father himself must be neat and clean at the job, otherwise he cannot set a good example. He must never permit wetting a cow's teats when milking, as it is a dirty practice, and it makes the teats chap and become sore in cold weather. A small amount of vaseline may be rubbed on the hands if there is difficulty in milking dry, and it proves beneficial.

Another thing to instill in a boy's mind is, that it pays to be kind and patient with the cows at milking time—in fact, at all times. It is well known that one man can get more milk than another man from the same cow and with the same feed.

Beating a cow with a milk stool when she kicks or switches her tail sometimes "adds insult to injury." The milker is more often to blame for the cow's fear in letting down her milk than is the cow. The only way to overcome this fear is for her caretaker to be patient and gentle with her.—"The New Zealand Farmer."

### Iodine in the Sty.

Tincture of iodine is a remarkably good thing for use in treatment of skin abrasions and other injuries to the body of the pig, for if promptly applied, it will reduce or entirely overcome the swelling, reduce the irritation, and encourage rapid healing.

### Why Cattle Eat Nails.

The perplexing question, why cattle, and especially milch cows, are so prone to search for and swallow bits of metal like rusty nails, pieces of wire, old tins, spent cartridges, &c., has often been discussed without getting beyond the argument that it either indicates a depraved appetitie in the animals or a lack of minerals in the feeding.

The latter is likely to be the more probable reason, writes ''Autolycus'' in the ''Live Stock Journal.''

At any rate, it is the lean class of cows and stirks which are the most liable to acquire this bad habit.

When cattle are provided with mineralised salt licks, or fed concentrates containing minerals, they are less liable to swallow pieces of iron.

Old boots which frequently reach the pastures or arable fields by way of the manure cart, are a source of danger; but portions of soles, studded with sprigs or nails, are even a greater danger, because the cattle are likely to swallow the pieces of leather, while they can only chew or gnaw the whole boot, swallowing bits of the leather.

Rusty nails sticking in pieces of decayed timber are a twofold source of danger.

Nails and pieces of wire, when swallowed by cattle, are likely to become sharp from the action of the stomach juices, and to pierce its walls.

### Four Faults in Milking.

There are many points at which cream can be contaminated, and if his product is to be consistently graded ''choicest'' it is necessary for the farmer to be watchful at them all. Careless milking methods are a common cause of trouble. Second-grade taints may be introduced as a result of any of the following:—

1. Failing to wash the hands regularly and frequently while milking, and to change the water as soon as dirty.

2. Failing to wipe the cow's udder free of dust, mud, and manure, and to wash the teats prior to milking, preferably with water to which a little hypochlorite has been added.

3. Using unclean cloths for the cow's udder, or dirty towels for the milker's hands.

4. Failing to discard the first few squirts of milk from each teat.

### The Stud Piggery at Kairi.

With its choice herd of Tamworth pigs and a few well-bred Berkshires, the stud piggery at the State Farm, Kairi, North Queensland, is an attractive and profitable section of the farm's activities. Ten sows and a well-bred boar comprise the herd of Tamworths, and for general average quality they compare favourably with any stud pig herd in the Commonwealth. The Berkshire stud is small, for pure-bred Berkshires are not as good a sale proposition in the North as the red pigs. The pigsty accommodation is mostly portable, enabling the pigs to be used in grazing off crops. Eight pig paddocks all under cultivation and two additional grass paddocks are available for breeders and young pigs, while other areas will be made available as the section extends. Two lucerne paddocks adjoin the piggery.

The manager of the farm, Mr. W. H. Bechtel, has evolved a special type of portable water fountain for the pigs, which is very useful for the purpose. The crops under cultivation include field peas, rape, barley, lucerne, corn, and grasses in addition to other crops grown on the farm for stock food.

Three Wessex Saddleback pigs from imported strains have now been added to the stud, and are to be used in a series of cross-breeding experiments in the production of bacon for the local and export markets. Stud pigs from this farm have been distributed to many parts of Northern and Central Queensland, and have been instrumental in building up the quality of the pigs in those divisions of the State.

**Wild Pigs Declared a Pest.**

In the North of Queensland in the sugar-cane growing areas around Mossman and the newly settled areas of the Daintree River, wild pigs have become such a nuisance that a special regulation under the Sugar Experiments Stations Act has been provided, in which wild pigs have been declared a pest of canefields. Much has been done by poisoning and other means to reduce the numbers, but with dense tropical scrub bordering many of the cane farms, wild pigs and marsupials become serious pests.

**Retirement.**

Sir Francis Goodenough, speaking perhaps more particularly of the wealthy classes, says: "I think that a man, who at the same time loves his work and is keenly conscious of the duties of citizenship, will regard his retirement when it comes, not as a rest-cure, but as a chance of devoting himself to those larger issues."

There is, of course, the other sort of retirement. There are men who, when they leave the office for the last time, rub their hands and say: "Well, now I shall be able to improve my golf handicap."

Frankly, I don't envy them. Don't misunderstand me. I should soon get tired of improving my golf handicap as a daily and primary occupation. Heaven defend me from using up all my days—the brief, numbered days of this mortal life—on a pastime!

I think that all true workers hope to die in harness, with the sword in their hand worn down to the hilt. I think that they hope to retire from effort only when they retire from this world to turn gladly to whatever activity awaits them beyond.—"The Professional Officer" (Brisbane).

**Rain to Order—Experiments in Artificial Production.**

The prospect of inducing a greater reasonableness in nature with respect to its rainfall habits is a matter of perennial interest to the farmer, and that it is within the realms of the possible is indicated by an article in the November "Agricultural Gazette" of New South Wales. Two American scientists, Professors Warren and Bancroft, it is stated, have successfully produced rain in a series of experiments based on the natural process which takes place in the upper atmosphere. Moisture is always present in the upper atmosphere in the form of minute drops, so light that they remain in suspension. When particles of dust come in contact with the drops of moisture they are absorbed, thus increasing the weight of the drops. As a result of their electric charge (positive or negative) the particles tend to become aggregated into masses too heavy to remain in suspension and then fall as rain. Thus, clouds formed of vapour too light to fall as rain may be artificially weighted by electrically charged dust and immediate rain produced.

Acting on this theory a load of electrically charged sand was dropped from captive balloons on to clouds. Rain fell immediately. Professor Bancroft calculates that 40 lb. of electrified sand would be sufficient to dissolve into rain 1 square mile of clouds.

In subsequent experiments an aeroplane was used carrying sand with a charge, partly positive and partly negative, of 12,000 volts. The machine rose and disappeared among the clouds while spectators below awaited the miracle, which proved even more dramatic than before. The clouds burst in a violent shower of rain, while at the same time the sky cleared and the sun shone again.

In the Netherlands Professor Veraat has succeeded in producing rain over an area of about 8 square kilometres by throwing finely divided "dry ice," *i.e.*, solid carbon dioxide, form an aeroplane on to clouds. Similar experiments had been tried previously by various scientists using powdered kaolin, but had not given satisfactory results. Professor Veraat rose to a height of 2,500 metres in an aeroplane carrying 1½ tons of "dry ice" and fitted with a special spreading apparatus; he then let the powder fall on to clouds 200 metres below. Abundant rain immediately fell. The experiment was officially controlled by observers in four military aeroplanes.

Professor Veraat explains the formation of rain by supposing that during the fall from the aeroplane to the clouds the particles of solid carbon dioxide become electrically charged and transformed into microscopic drops of liquid carbon dioxide, which caused condensation in the clouds and consequently a fall of rain. According to Professor Veraat this method will also make it possible to ensure fine weather when desired. By converting the clouds into rain early in the day he holds that a clear sky may be assured in a given locality for the rest of the day.

**Repair of Iron Tanks—Two Effective Methods.**

There are two methods of repairing a galvanised corrugated iron water tank which shows signs of rusting or corroding—one is to line the inside with wire-netting and to apply over this a coating of cement mortar about an inch in thickness, and the other is to reline it first as before with wire-netting and then with sheets of corrugated iron, leaving a 2½-in. cavity, which is filled, as the process of lining proceeds, with concrete. By the first method the life of a tank can be considerably lengthened, but the thickness of cement is not sufficient to support the contents once the iron has perished. By the second method, however, one constructs a solid concrete tank, using the iron tank as a mould, and the result is a structure which will remain in commission very many years after the original has powdered to rust.

Generally speaking, the use of tanks of not less than 2,000 gallons is advocated; such tanks, when they begin to show signs of wear, can be converted into concrete tanks as described above, at a cost which will be considerably less than that of the purchase of a new iron tank. Such treatment appreciably reduces the volume of the tank, and tanks of less capacity than 2,000 gallons are scarcely worth converting in this way. Even by the first-mentioned method the cost of renovation makes its economy doubtful if the work has to be paid for at builders labourer's rates. If the farmer does it for himself, however, or if it is done by a farm or station employee, the cost should be much less than that of the replacement of the tank.

To repair a tank by this method, first brush all rust from the inside surface and tie around it on the inside wire-netting, preferably of 2-in. mesh, passing the tieing wire through small holes in the tank and twitching it up tight. Then plaster the sides through the netting with cement mortar made up of three parts clean sand and one part cement. Continue until the netting is covered, leaving a scratched or roughened surface to form a key for the next coat. In the same way put on the bottom of the tank a 1-in. thickness of the cement mortar.

When this is sufficiently set, a ⅜-in. coat of a stronger mortar (equal parts sand and cement) should be trowelled on and finished to a smooth face. Finally, a coat of wash, made of 1 lb. washing soda to 4 gallons of water, should be applied. Holes punched from the outside of the tank with a 4-in. nail are a help to the keying of the cement, and a convenience for the tie wires. The outside of the tank should be painted when the repairs are finished.

To repair a tank by the other process mentioned, remove the top by cutting close round the wall and reserve the top for the new tank. Fix wire-netting, preferably 2-in. mesh, to the wall of the tank, and secure this in position by tie wire passed through holes specially punched in the tank for the purpose.

On the bottom of the tank lay a concrete floor 1-in. thick; on top of this set wire-netting as for the walls, and then place another 1 in. of concrete, making a total thickness of 2 in. While this concrete is still wet, take three sheets of new corrugated iron, previously curved to a diameter of 5 in. less than the old tank, and secured at the laps with galvanised roof bolts set with the heads inside. Set this in position inside the tank, thus leaving a 2½-in. cavity all round. Now fill concrete into the cavity in small quantities, and carefully tamp solid; the "water-tightness" of the tank is dependent on the thoroughness of this tamping. Having concreted the cavity to the top of the first ring, take three more sheets, fix in position and concrete as before, and do likewise with a third set.

To enclose the tank take the top that was removed from the old tank, set it in position, and turn down the projecting edge into the wet concrete to secure the top against wind pressure. When all the cement liquid that has run through the holes in the old tank has dried, scrape reasonably clean and apply one coat of oil paint.

The materials required to line a 2,000-gallon tank will be: Nine 9-ft. sheets of 26-gauge corrugated iron curved to 7 ft. 10 in. diameter, 3 dozen ½-in. galvanised roof bolts, 10 yards of 72 x 2 in. x 18-gauge netting, 1 cubic yard of coarse sand, and ten bags of cement. Total cost in Sydney, £6. The concrete should be gauged one part cement to three parts sand.

It must be remembered that both these treatments, and, especially the latter, add considerably to the weight of the tank, and it is necessary to make sure that the stand or supports are strong enough for the purpose.—"A. and P. Notes," New South Wales Department of Agriculture.

**Australian Citrus Fruits in Canada.**

In a report on the shipment of citrus fruit he accompanied to Canada as part of his investigation into citrus fruit problems, the Director of Fruit Culture of the New South Wales Department of Agriculture stated that the shipment, which consisted of 3,814 cases of oranges and 776 cases of lemons, arrived at Vancouver on 12th August in excellent condition, the fruit being clean and bright and the quality good. As far as could be gathered from an inspection on the wharves no waste had occurred. The Government fruit inspector and the selling agents' representative both remarked upon the fine appearance of the fruit, which they considered was equal to the best of the Californian pack. At the time of writing the oranges were being sold in Vancouver shops at a price equivalent to about 2d. each. Good publicity was given the shipment, and in many instances the fruit was being displayed in the shop windows alongside Californian Late Valencias, which, it was stated, were certainly showing it off to advantage.

While the lemons did not carry quite as well as the oranges, the fruit mostly had a bright appearance on arrival and was favourably commented upon. The larger lemons were found to carry better than the smaller fruit. The selling agents intimated that there was a better market for lemons than for oranges, and they expected to sell the whole of the shipment of the former at a good price, straight from the wharves.

**Common Causes of Colic in Horses.**

Perhaps the commonest cause of colic is giving horses food to which they are not accustomed. A sound physiological reason exists for not doing this. It has been proved that the character of the food influences the quantity and quality of the gastric and pancreatic juices. A definite and constant diet produces juices capable of digesting it, but utterly incapable of dealing with sudden changes of food. Under proper conditions, no food will cause colic, although some (as for example, wheat and barley) are more indigestible than others; but many foods will do so if given in excess, or at the wrong time, such as giving lucerne to a horse that has been starved for a time. Horses can be made to exist on practically any food that is digestible, provided they are gradually accustomed to it; but to give a horse a full feed of, say, maize, if he has never had the grain before, is to invite digestive troubles that may cause death. Again, grass-fed horses suddenly put on to dry feed on being taken on a long journey get colic, owing to the sudden change of food.

If you wish to avoid colic, give food at regular intervals, and see that the food is of good quality and of proved dietetic value. Mouldy corn, damaged oats, or musty hay very often produce colic, while proprietary foods of unknown composition, and frequently of doubtful feeding value also, often do a great deal of harm. Do not give green forage in an immature, fermented, or over-ripe condition.

Bran mixed with maize is a favourite food, but it is much too laxative for a horse in work, and is a frequent cause of an attack of colic. Do not give large quantities of bran to a working horse. Because of its laxative properties, bran is a good food, especially during periods of rest; but its nutritive value is practically nil owing to all the flour being extracted from it.

Do not suddenly alter the amount of food given. It is a common practice to have horses fed up for a day or two prior to severe work, and this causes much intestinal trouble, such as stomach staggers.

Never forget that young horses cannot digest as much corn as old ones. Horses, when rested, even for a day or two, should have their food, especially corn, reduced. Failure to do this is the cause of much colic.

Another common cause of repeated slight attacks of colic, especially with working horses on farms, is the dry, rough, coarse, and indigestible nature of the herbage found in many paddocks. Too much coarse food prevents digestion by reason of its irritative effect on the stomach. A certain amount of bulky fodder increases the digestibility of the more concentrated foods, such as oats, but too great a quantity of such food greatly weakens the power to digest. A good example of the results of this is seen in so-called "wild melon poisoning."

The horse's stomach is not adapted for the digestion of coarse food, and any coarse food that it eats is digested in the large intestines. Farm horses, as a rule, eat far too much rough bulky fodder, and many suffer in consequence. A working farm horse does not require more than 12 lb. of hay a day, and the rest of the ration should be made up of grain, such as oats, or half oats and maize.—A. and P. Notes, N.S.W. Dept. Agric.

# The Home and the Garden.

## OUR BABIES.

*Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.*

### THE ONLY CHILD.

THERE seems to be special difficulty in rearing satisfactorily an "only" child, and this applies equally to the physical and mental aspects of the child's development. This may be due in part to the fact that an "only" child is usually the first child and the child of inexperienced parents. Conversely the first child in any family is usually the only child in the home until a second child is born, and during this period has to face many of the early difficulties of the only child; while the youngest child of a larger family may meet with some of the later difficulties of an only child, especially if there is a big difference in age between it and the next elder child.

#### The Physical Aspect.

To take first the physical aspect; the only or first child is likely to meet more than an average share of the common difficulties which often interrupt the smooth course of such natural processes as birth, the establishment of breast feeding and its successful continuity, and the change over to mixed feeding called weaning; and it is, unfortunately, possible that a child may be seriously handicapped in life by a serious disturbance associated with any of these processes. The mother is usually young or inexperienced, or both, and she has to get most of her experience by learning from the mistakes she may make with her first child. If she has been fortunate enough to have good ante-natal and post-natal care, so that she is as physically fit as possible for nursing, she and the baby will escape many miseries, such as cracked and inverted nipples, breast abscesses, and other difficulties lying in wait for the inexperienced mother, and by keeping in touch with the nearest baby clinic, by post if necessary, she will be saved from making many mistakes as the months go on and helped to give her babe that good, sound, physical health which will enable him to face his moral and social problems as they arise, with a great measure of success.

#### Too Much in the Limelight.

The only child is in danger of spending his early days in an atmosphere of excitement, surrounded by admiring relatives and friends, all of whom are intensely interested in the first baby, and, naturally, desirous of seeing him—when awake, if possible. If he is the one and only grandchild on either side, the position may be even more acute. It is a wise plan for the nurse to refuse admission to all visitors, except two or three near relatives, during the first week after the birth, so that the mother and babe may be kept quiet and placid until the milk flow is well established. Even after this time the mother is often easily exhausted by seeing visitors, and this is bad both for her and the child. After her convalescence the "only" child remains an object of unusual interest, and he may develop into a "nervous" child if his surroundings are too stimulating. He is too much "in the limelight," receives too much attention and nursing, and does not learn how to lie quietly amusing himself during most of his waking hours. He then becomes dependent on others for entertainment and cries if left alone—he is becoming a "spoiled" baby. As "only" children are more common in the families of the well-educated and well-to-do, the child may naturally be of a highly-strung temperament, and a lack of placidity in his environment will increase his tendency to be restless and excitable. These "nervous" babies frequently kick, wriggle, or laugh until they vomit their food. Some vomit

very readily on slight movement by themselves or on being handled by others. Unless quiet surroundings can be secured, this vomiting may seriously interfere with the child's nutrition.

**After the Nursing Stage.**

Once our "only" baby successfully passes the nursing stage, he meets further dangers after weaning as his intelligence develops, and he learns to note the emotional reactions of those around him. His anxious mother may hang over him at meals, watching each mouthful, perhaps coaxing him to eat foods specially prepared, and voicing her grief when he refuses. He soon may learn to get more "thrill" out of being coaxed than out of eating. Next, he may learn to like the excitement of watching his mother's face "register" disappointment, anxiety, and fear because he has refused some food. The next stage is that he gets into the habit of refusing food, especially the milk foods, whose refusal causes such dramatic despair around him, and possibly the substitution of more appetising but less desirable dishes so that he often becomes truly under-nourished. At this stage his mother usually seeks medical advice, but much depends on her own self-control and intelligence if her baby is to be restored to normal health. In many cases she is by this time quite unfit to tackle the problem firmly, being more or less a nervous wreck, but, fortunately, it is often easy for another person to overcome the child's bad habits, especially in surroundings where other normal children are eating their meals with relish. Suitable foods must be chosen for three or four meals in the day, according to the child's age and requirements. Then a suitable meal must be attractively served and placed before him in a cheerful, matter-of-fact way, which does not anticipate any difficulty. If he refuses the meal no comment should be made, but only drinks allowed until the next meal is fully due, when the procedure must be repeated. With regard to milk, it is helpful to remember that every child begins by liking milk, his natural food, very much indeed, and he will like cow's milk, too, unless some error arises in his management during or after weaning. Perhaps the commonest mistakes are to give too many more tasty foods like sugar, jam, cake, &c., or to leave weaning until rather late, when the child is old enough in intelligence to notice and remember the different associations of cow's milk and breast milk. The mother of an only child is often reluctant to wean and commences the gradual process of establishing the child's independence of her, but it is very important for the child's sake that this process should not be retarded at any stage, unless made necessary by some such emergency as illness. Sometimes the trouble with milk is due to the fact that the parents have made a special effort to get rich Jersey milk for their one and only child, in their aim at giving him everything of the best, and he may have become unable to digest the fat and need dieting for a time. The company and example of other normal children at meals is a great help. Sometimes the milk is found more attractive when made into junket, milk jelly, weak cocoa, boiled or baked custard or milk puddings (made with plenty of milk). One child drank milk readily when it was coloured pink with a little cochineal. The "boiled" flavour can be avoided by pasteurising or scalding the milk instead of actually letting it boil vigorously.

**Coddled and Petted.**

As the months go on and the "only" child develops trifling illnesses, the mother is apt to suffer anxiety quite out of proportion to the seriousness of the case. One such mother said, "I get so afraid that my mouth is dry and I cannot swallow food." The "only" child is apt to be so carefully guarded that he leads an unnatural life. He is coddled and petted after getting little bumps and bruises, and may develop into a "cry-baby," who will run to his mother instead of facing little difficulties for himself, while each little accident brings agony to the apprehensive mother, who has not other children to give her balance and a sense of proportion. The father is often a help at this stage, as usually he sees more clearly the situation, but in some cases the father is the more anxious and fussy of the parents. He also sometimes makes the natural mistake of over-exciting the child on his return home from his day's work, even perhaps waking the child up for a romp because he "has not seen the little chap all day." Yet he does not appreciate the exactly parallel situation when his son wakes at 5 a.m., when the little chap is feeling ready for a romp!

As the years go on the mental and social development of the only child needs special understanding and treatment from time to time, and a few hints in regard to this matter will be given in a later article.

# Orchard Notes for April.

## THE COASTAL DISTRICTS.

In the Orchard Notes for March the attention of citrus-growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus—and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus-growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly-cleared land time to sweeten before planting.

# Farm Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in—every effort should be made to bring the seed-bed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

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## CLIMATOLOGICAL TABLE—JANUARY, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. Means. Max. | Means. Min. | Extremes. Max. | Date. | Extremes. Min. | Date. | Rainfall. Total. | Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| *Coastal.* | | | | | | | | | |
| Cooktown .. .. | 29·81 | 90 | 75 | 100 | 6 | 71 | 4, 13 | 534 | 9 |
| Herberton .. .. | ... | 86 | 65 | 90 | 12, 13 | 57 | 12 | 655 | 12 |
| Rockhampton .. .. | 29·81 | 91 | 73 | 103 | 12 | 69 | 30 | 1,244 | 11 |
| Brisbane .. .. | 29·86 | 86 | 70 | 94 | 16 | 65 | 8 | 1,001 | 14 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. | 29·82 | 91 | 66 | 104 | 12 | 58 | 31 | 444 | 10 |
| Stanthorpe .. .. | .. | 83 | 60 | 97 | 13 | 48 | 31 | 752 | 13 |
| Toowoomba .. .. | .. | 84 | 62 | 99 | 13 | 52 | 31 | 940 | 14 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·77 | 94 | 73 | 102 | 13, 14 | 69 | 6 | 1,034 | 22 |
| Longreach .. .. | 29·73 | 104 | 75 | 110 | 19, 2, 11 | 66 | 31 | 221 | 5 |
| Mitchell .. .. | 29·76 | 98 | 68 | 107 | 11, 12 | 56 | 6, 31 | 92 | 11 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 29·78 | 97 | 78 | 106 | 15 | 70 | 31 | 261 | 4 |
| Boulia .. .. | 29·75 | 104 | 73 | 114 | 10 | 64 | 7, 8 | 17 | 1 |
| Thargomindah .. .. | 29·76 | 99 | 71 | 112 | 10 | 61 | 8 | 9 | 3 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JANUARY, 1933, AND 1932 FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. Jan. | No. of Years' Records. | Total Rainfall. Jan., 1933. | Jan., 1932. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 12·12 | 32 | 8·41 | 15·74 |
| Cairns .. .. | 17·00 | 51 | 5·59 | 37·13 |
| Cardwell .. .. | 16·86 | 61 | 12·16 | 23·99 |
| Cooktown .. .. | 14·71 | 57 | 5·34 | 29·34 |
| Herberton .. .. | 9·67 | 47 | 6·55 | 11·39 |
| Ingham .. .. | 16·02 | 41 | 2·45 | 14·14 |
| Innisfail .. .. | 20·68 | 52 | 6·12 | 38·76 |
| Mossman Mill .. | 17·86 | 20 | 8·40 | 28·12 |
| Townsville .. .. | 11·20 | 62 | 5·99 | 8·86 |
| *Central Coast.* | | | | |
| Ayr .. .. | 11·36 | 46 | 5·16 | 12·31 |
| Bowen .. .. | 10·23 | 62 | 7·36 | 9·96 |
| Charters Towers .. | 5·55 | 51 | 1·76 | 4·64 |
| Mackay .. .. | 14·56 | 62 | 9·05 | 29·49 |
| Proserpine .. .. | 16·64 | 30 | 5·34 | 25·02 |
| St. Lawrence .. | 9·57 | 62 | 3·40 | 5·79 |
| *South Coast.* | | | | |
| Biggenden .. .. | 5·28 | 34 | 9·31 | 1·23 |
| Bundaberg .. .. | 8·90 | 50 | 12·50 | 0·52 |
| Brisbane .. .. | 6·49 | 82 | 10·01 | 3·06 |
| Caboolture .. .. | 7·78 | 46 | 4·91 | 1·49 |
| Childers .. .. | 7·66 | 38 | 8·23 | 0·39 |
| Crohamhurst .. | 12·75 | 40 | 7·09 | 0·90 |
| Esk .. .. | 5·73 | 46 | 5·96 | 0·46 |
| Gayndah .. .. | 4·67 | 62 | 6·40 | 0·45 |
| Gympie .. .. | 6·72 | 63 | 6·67 | 0·26 |
| Kilkivan .. .. | 5·61 | 54 | 5·46 | 0·05 |
| Maryborough .. | 7·39 | 61 | 5·61 | 0·62 |

| Divisions and Stations. | Average Rainfall. Jan. | No. of Years' Records. | Total Rainfall. Jan., 1933. | Jan., 1932. |
|---|---|---|---|---|
| *South Coast—continued—* | In. | | In. | In. |
| Nambour .. .. | 10·00 | 37 | 5·72 | 0·90 |
| Nanango .. .. | 4·69 | 51 | 4·48 | 1·19 |
| Rockhampton .. | 7·76 | 62 | 12·44 | 1·88 |
| Woodford .. .. | 7·98 | 46 | 4·89 | 0·84 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 3·26 | 63 | 4·44 | 0·96 |
| Emu Vale .. .. | 3·14 | 37 | 5·08 | 0·98 |
| Jimbour .. .. | 3·52 | 45 | 4·12 | 0·88 |
| Miles .. .. | 3·63 | 48 | 3·46 | 0·62 |
| Stanthorpe .. | 3·51 | 60 | 7·52 | 0·59 |
| Toowoomba .. | 5·00 | 61 | 9·40 | 0·48 |
| Warwick .. .. | 3·50 | 68 | 7·48 | 1·23 |
| *Maranoa.* | | | | |
| Roma .. .. | 3·15 | 59 | 2·22 | 0·44 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 1·87 | 19 | 1·38 | 0·57 |
| Gatton College .. | 4·12 | 34 | 10·26 | 2·29 |
| Gindie .. .. | 3·78 | 34 | 5·51 | 1·33 |
| Hermitage .. | 3·12 | 27 | ... | 1·72 |
| Kairi .. .. | 9·55 | 19 | 5·04 | 17·68 |
| Mackay Sugar Experiment Station | 14·77 | 36 | 7·27 | 25·51 |

GEORGE E. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

### AT WARWICK.

| | March, 1933. | | April, 1933. | | MOONRISE. Mar., 1933. | MOONRISE. Apr., 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| 1 | 5·48 | 6·21 | 6·5 | 5·47 | a.m. 9·50 | a.m. 11·19 |
| 2 | 5·49 | 6·20 | 6·6 | 5·46 | 10·45 | p.m. 12·13 |
| 3 | 5·49 | 6·19 | 6·6 | 5·45 | 11·32 | 12·59 |
| 4 | 5·50 | 6·18 | 6·7 | 5·43 | p.m. 12·33 | 1·47 |
| 5 | 5·51 | 6·17 | 6·7 | 5·42 | 1·27 | 2·27 |
| 6 | 5·51 | 6·16 | 6·8 | 5·41 | 2·19 | 3·4 |
| 7 | 5·52 | 6·15 | 6·8 | 5·40 | 3·8 | 3·37 |
| 8 | 5·52 | 6·14 | 6·9 | 5·39 | 3·53 | 4·8 |
| 9 | 5·53 | 6·13 | 6·9 | 5·38 | 4·32 | 4·41 |
| 10 | 5·53 | 6·12 | 6·10 | 5·37 | 5·8 | 5·16 |
| 11 | 5·54 | 6·11 | 6·10 | 5·36 | 5·51 | 5·52 |
| 12 | 5·55 | 6·9 | 6·11 | 5·34 | 6·13 | 6·33 |
| 13 | 5·55 | 6·8 | 6·12 | 5·33 | 6·45 | 7·24 |
| 14 | 5·56 | 6·7 | 6·12 | 5·32 | 7·19 | 8·26 |
| 15 | 5·56 | 6·6 | 6·13 | 5·31 | 7·56 | 9·30 |
| 16 | 5·57 | 6·5 | 6·14 | 5·30 | 8·41 | 10·35 |
| 17 | 5·57 | 6·4 | 6·14 | 5·29 | 9·34 | 11·39 |
| 18 | 5·58 | 6·3 | 6·15 | 5·28 | 10·33 | .. |
| 19 | 5·59 | 6·2 | 6·15 | 5·27 | 11·37 | a.m. 12·45 |
| 20 | 5·59 | 6·0 | 6·16 | 5·27 | .. | 1·46 |
| 21 | 6·0 | 5·59 | 6·17 | 5·26 | a.m. 12·42 | 2·43 |
| 22 | 6·0 | 5·58 | 6·18 | 5·25 | 1·48 | 3·39 |
| 23 | 6·1 | 5·57 | 6·18 | 5·23 | 2·51 | 4·34 |
| 24 | 6·1 | 5·56 | 6·19 | 5·23 | 3·52 | 5·29 |
| 25 | 6·2 | 5·54 | 6·19 | 5·22 | 4·50 | 6·23 |
| 26 | 6·2 | 5·53 | 6·20 | 5·21 | 5·45 | 7·21 |
| 27 | 6·3 | 5·52 | 6·20 | 5·21 | 6·40 | 8·17 |
| 28 | 6·4 | 5·50 | 6·21 | 5·20 | 7·37 | 9·10 |
| 29 | 6·4 | 5·49 | 6·21 | 5·19 | 8·33 | 10·3 |
| 30 | 6·5 | 5·48 | 6·22 | 5·18 | 9·30 | 10·54 |
| 31 | 6·5 | 5·47 | .. | .. | 10·24 | .. |

## Phases of the Moon, Occultations, &c.

4 Mar. ☾ First Quarter 8 23 p.m.
12 ,, ○ Full Moon 12 46 p.m.
19 ,, ☽ Last Quarter 7 5 a.m.
26 ,, ● New Moon 1 20 p.m.

Apogee, 4th March, at 4.6 a.m.
Perigee, 16th March, at 2.30 a.m.
Apogee, 31st March, at 11.12 p.m.

On the 6th Mercury will reach its greatest height, 18 degrees above the horizon at sunset, being apparently near the borderline between Aquarius and Pisces, and Venus and Saturn having set before the sun, Mercury will be favourably placed for general observation as the twilight deepens and the planet comes into clearer view.

An interesting occultation of Regulus, the principal star in Leo, will take place in Northern Queensland at an early hour on the 10th, and should attract the attention of many naked-eye observers, who will find the Moon approaching Regulus as soon as they become observable after sunset.

Mars and Neptune will reach the meridian almost exactly at the same time, shortly before midnight on the 11th, but Mars will be 3 degrees further north than Neptune. Jupiter will reach the meridian 6 hours earlier.

On the 21st at midday the Sun will be on the equator, crossing from south to north, and the Australian autumnal equinox will occur. The rising and setting of the Sun will then be due east and west.

The conjunction of Saturn with the Moon at 1 p.m. on the 22nd should form an interesting daylight spectacle, as they will be halfway between the meridian and the western horizon. Saturn will be 2 degrees north of the moon.

On the 23rd, when Mercury is passing from the east to the west side of the Sun, it will be as much as 4 degrees southward of it.

Mercury and Venus will be in conjunction with the Moon at 2 and 3 a.m. on the 26th before rising. When above the horizon their grouping together will be too near the Sun to be observable.

Mercury sets at 7.6 on the 1st and at 6.32 p.m. on the 15th.

Venus rises at 4.48 a.m. on the 1st and at 5.12 a.m. on the 15th.

Mars rises at 6.41 p.m. on the 1st and at 5.19 p.m. on the 15th.

Jupiter rises at 6.54 p.m. on the 1st and at 5.56 p.m. on the 15th.

Saturn rises at 3.23 a.m. and sets at 5.2 p.m. on the 1st; on the 15th it will rise at 2.45 a.m. and set at 4.1 p.m.

3 Apr. ☾ First Quarter 3 56 p.m.
10 ,, ○ Full Moon 11 38 p.m.
17 ,, ☽ Last Quarter 2 17 a.m.
25 ,, ● New Moon 4 38 p.m.

Perigee, 12th April at 9.12 p.m.
Apogee, 28th April at 2.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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# Event and Comment.

## A Motto for Queensland Producers.

"COMPETITION throughout the world is getting keener every day, and the Queensland producers' aim should be to produce something better than the other man. They can do it, and there is no reason why they should not do it; our motto in this State should always be, " 'Queensland is never satisfied with anything but the best.' " Those sentiments, expressed by His Excellency the Governor, Sir Leslie Orme Wilson, at the opening of the Toowoomba Show, will be applauded by every Queenslander who has faith in himself and in the future of the land he lives in. In continuing his remarks the Governor stressed the need for improvement in breeding stock and preparing primary produce, and referred to the necessity for care in grading fruit for export. The fruit produced from the Granite Belt was equal to the best in the world, and every endeavour should be made to see that it arrived on the tables of Great Britain in the same condition that it left the trees.

He was a firm believer in the future of Queensland, but it had to be borne in mind that this State had not yet attained the high ideals of perfection. There was something still to be done, and it could be done. Exhibitions were playing a very important part in improving the qualities of the State's primary products.

## The Future of the Sugar Industry.

ADDRESSING sugar technologists in the course of their annual conference at Ayr last month, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, expressed the view that the time had now come when Queensland would have to alter its policy and extend it to provide more safeguards to an industry of such vital importance as sugar. The Minister said that the sugar technologists played an important part in the industry. People were turning from the field to the mill, and from the mill to the laboratory, to find how their difficulties might be overcome.

If a history of agriculture in Queensland were written the most valuable chapter would be the extension in Queensland of the sugar industry. It was unfortunate that a wider conception of the industry did not exist in the South. In the last few years the industry had sustained a severe blow, and most growers would turn to the technical adviser for help. The technologists had been paying close attention to the economic side, and there was distinct evidence that the sugar industry was doing all it could to overcome its difficulties.

He referred to the good work of officers of the sugar branch of the Agricultural Department, particularly the late Mr. H. T. Easterby. He believed that the two most important questions for the industry at present were combating disease and breeding the right types of cane. The recommendations which the conference made would receive the consideration of his department. It was also his belief that it would be necessary to utilise the services of the trained men to a greater extent in the future.

## The Butter Position.

THE present position of the dairy industry is regarded so seriously that the Queensland Butter Board and Council of Agriculture have called a conference of Commonwealth dairy-producing interests in Sydney on 21st April. In the course of a joint statement both bodies express concern that apparently there is to be no result from the Melbourne conference in January, since when the downward trend in prices has continued. In a statement on the subject issued by the Butter Board in February, it was shown that the net values to the Queensland factories for all butter had fallen from 175s. per cwt. in January, 1929, to 92s. 4d. (estimated) for January, 1933, the difference representing an annual loss to the dairy farmers of the Commonwealth to 30th June, 1933, of approximately £14,500,000, or a falling-off in values of nearly 50 per cent. The annual loss per dairy farmer would work out at £120. As the estimated figure for January would not be realised the loss would be greater.

Much of this decline might be regarded as unavoidable, but there were other factors which might by organisation be mitigated or obviated—namely, that portion of the fall in values due to extra keen competition on the British market, and the existing system of price fixation in the Commonwealth on the basis of London values. The industry could not expect any great measure of relief whilst such heavy supplies were available in Britain, but there was ample scope for an endeavour to bridge the gap at present obtaining between the values for Australian and Danish butter. The system at present in operation under which every fall in Britain was registered throughout the Commonwealth could undoubtedly be obviated, and it was to this that they considered the immediate attention of the industry should be directed.

At the commencement of October, 1932, the price of Australian butter in London was 106s. per cwt. To-day it was 72s., representing a fall of over 30 per cent., and under the present system there had been a corresponding fall throughout the Commonwealth. The purchasing power of the consumers of the Commonwealth, however, had not fallen nearly 30 per cent. within the past six months.

A further conference is now regarded as vitally necessary for the purpose of evolving some scheme promising the industry speedy and permanent relief.

## Pasture Improvement Below the Border.

GREAT enthusiasm is being displayed in pasture improvement work in the New England district, according to Mr. L. P. Dutton, the well-known Hereford breeder of Urandangie, Guyra. This, he said in the course of a recent Press statement ("S. M. Herald," 28th March), was shown by the large area now sown to artificial pasture, and the volume of sowing this autumn. Unfortunately, conditions were now very dry, causing some concern to those who had already sown their grasses and retarding the efforts of intending planters.

Urandangie, Mr. Dutton mentioned, was a property of about 7,300 acres, of which over 1,000 acres were now under improved pastures. The main native grasses of the district were wallaby, kangaroo, tussocky poa, and red grass, but these were not to be compared with the sown areas, which had a 100 per cent. greater carrying capacity. The old land was thoroughly prepared for sowing, by ploughing, and then fallowing for twelve months, followed by another ploughing and working prior to seeding. The mixture generally used on the heavy basaltic clays was Phalaris tuberosa 2 lb., and perennial rye 8 lb. Black medic at the rate of 2 lb. per acre was included in the mixture when sowing on some of the very heavy patches of soil. Cocksfoot was utilised on the lighter formations, as was the Wimmera rye-sub. clover combination—a mixture which proved very profitable on suitable areas. The great value of improved pastures in the district was in providing winter and early spring feed when the native grasses were furnishing little palatable fodder. In addition to their hardiness and ability to withstand heavy stocking, the capacity of the sown pastures to top off fattening cattle and sheep was most marked.

## Boys for the Land.

WITH co-operation of religious organisations and support from other bodies, the Minister for Labour and Industry (Hon. M. P. Hynes) hopes to be able to place a thousand city youths on farms in the course of the current year. Mr. Hynes expressed pleasure recently that leaders of every denomination had signified their interest in the rural training scheme approved by the Government and their willingness to co-operate.

All the Church representatives who had seen him had expressed sympathy with the movement to transfer boys from the city to the country. Personally, he thought that many of the boys, if given an opportunity to appreciate the healthy life of the country, would become landminded and would prove valuable settlers. He had high hopes for the success of the training plan that he had outlined recently, and as 1,000 boys had been placed under a similar scheme in Western Australia within the past year he could see no reason why Queensland should not at least do as well as that.

Mr. Hynes emphasised that present employees on farms would have to be protected against displacement by learners, and the farmers who took the boys would be required to give an undertaking not to use them to displace other labour at present employed in rural industry.

## Dairying Expansion in Tropical Queensland.

THE Minister said he was particularly interested in the expansion of the dairying industry in the North. Three outstanding instances of the pioneering were found at Daintree, Silkwood, and Mackay. Butter factories had been established in each centre. The Daintree factory was of particular interest, because it was probably the only butter factory that operated so far into the tropical area in any country in the world, and an excellent grade of butter was being made. The Atherton Tableland was a unique tract of agricultural country. The problem of the grass growth was serious, and it was the intention of the department to undertake a more specific investigation in this direction at an early date.

Opportunity was taken by Mr. Bulcock in the course of his tour to meet departmental officers and to visit experimental farms. Among the farms visited by the Minister and the party were the former banana experimental station at Bartle Frere, the Johnstone River Sugar Experimental Station, the Kairi State Farm, and the Mackay Sugar Experimental Station. The position of all these stations would be reviewed in the near future, as it was his intention to make an effort to obtain co-ordination to a greater extent among the various departmental agricultural activities in the North.

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

### COMPLETE DESTRUCTION OF CANE STOOLS CAUSED BY GRUBS OF THE GREYBACK COCKCHAFER.

By EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

### PREDOMINANCE AND MAXIMUM ACTIVITY OF THIRD-STAGE GRUBS OF OUR CANE BEETLE.

THE widely spread damage caused by this formidable insect pest is, perhaps, best seen from the windows of a railway carriage while travelling through or close to grub-infested localities—such as occur, for instance, alongside the Kuranda line between Redlynch and Jungara, or, while journeying to Babinda, between Gordonvale and Deeral.

Amongst an otherwise green expanse of cane-leaves one will at once notice at this time of year large patches of several acres in extent of a uniform dark-brown colour, with marginal edges of same contrasting sharply with the surrounding bright green healthy cane. In such affected areas all the stools have been killed outright, the leaves being dry, twisted, and dead.

From five to fifteen or more greyback grubs may be found under a single stool of such cane, giving an average of at least 70,000 per acre. After suffering a mortality of from 5 to 6 per cent., however, from attacks of parasitic and predaceous insect and other enemies, the survivors eventually transform into pupæ, at depths in the ground varying from 12 to 15 inches, and in due course about 64,000 beetles would emerge from each acre of such infested land. Fifty per cent. of these are usually females, capable of producing collectively about 768,000 eggs, from which grubs hatch a week or so later.

With further reference to this interesting question of the numerical increase of our greyback beetle, it may be mentioned that in the Cairns district alone, during the 1914 season, no less than 22 tons of these cockchafers were collected in about three weeks. This amount represented fully 8,400,000 greybacks, which are able, under favourable conditions, to destroy 165,000 tons of sugar-cane.

### MOVEMENTS OF FULLY-GROWN GRUBS OF THE GREYBACK.

The following notes are supplementary to those published last month under the heading of "Subterranean Movements of the Mature Grub," but deal more particularly with the final activities of third-stage larvæ just before transformation into the pupal state. During wet weather in March or April, when at times even light well-drained soils become more or less saturated, these grubs will often work up to the surface in order to obtain sufficient air; and in fields where the trash has been left between the rows after harvesting they occasionally come right out of the soil and lie on top of the ground in semi-darkness, hidden more or less by the litter of dead leaves. Indications of maximum injury to cane are often seen towards the end of April, when the fully-fed grubs, having devoured most of the large roots, eat big holes into or gnaw completely through the juicy basal portions of the cane sticks, gradually bringing them one by one to the ground. Under cover of these fallen canes and leaves, which afford ample overhead protection from sunlight, they soon commence to gnaw deeply into the lower surface of canes lying in close contact with the bare earth, usually preferring the soft cellular tissue of the internodes to harder or less succulent portions. (See accompanying plate.)

## METHODS OF CONTROLLING CANE GRUBS.

### Fumigation of Grub-Infested Cane Land.

This valuable means of control has been fully described. On farms which have been fumigated, all hand-injectors or other apparatus used should now be thoroughly cleaned and overhauled before being put away until next season.

### Control Effected by Insectivorous Birds.

Our growers would do well to cultivate a regard for the many species of birds which are helping greatly to thin the ranks of this notorious cane insect, both in its beetle and grub conditions. In these enlightened days, when entomologists are so fond of voicing the merits of biological control, we are, perhaps, inclined to dwell too much on the entomological side of this question, and not enough on the advantages to be derived from a closer study of our insect-eating birds and their habits. We must not forget that the services rendered by birds in helping to maintain what is known as the balance of nature cannot be too highly valued by the man on the land.

Incredible as it may seem, one occasionally hears reports of the shooting of ibis and other grub-eating birds for food. Such foolish slaughter, if continued, must eventually lead to several of these feathered friends avoiding the neighbourhood of canefields and feeding elsewhere. About fifteen years ago it was not unusual to see flocks of the Straw-necked Ibis in canefields around Gordonvale and Highleigh picking up grubs behind the plough, but now only one or two specimens are noticed at work in a field, while in some localities this valuable bird appears to have disappeared altogether. The areas proclaimed as bird sanctuaries which chiefly concern residents around Cairns are:—The Shires of Cairns and Barron, the Bellenden Ker Reserve, Kuranda (Mona Mona Mission), and Lake Barrine Reserve.

Amongst the list of 123 birds which are protected during the whole of the year throughout Queensland, the following render more or less important services in our canefields:—(1) Straw-necked Ibis; (2) White Ibis; (3) Pewee or Mud Lark; (4) Indian Mynah; (5) Leatherhead; (6) Laughing Jackass; (7) Fig Bird; (8) Blue Jay; (9) Australian Bee Eater; (10) Black and White Fantail; (11) Black-faced Cuckoo Shrike; (12) Pallid Cuckoo.

### Insect Enemies of Greyback Grubs.

Our two common species of "Digger Wasps" may be considered responsible for a mortality of from 5 to 8 per cent. of second and third stage grubs. Being indigenous insects, however, their increase is effectually controlled by hyper-parasitic enemies, of which the principal are certain flies and a beetle.

Plate 28.
3. Digger-Wasp Parasite of Cane Grubs.

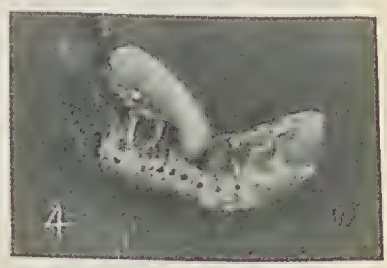

Plate 29.
4. Maggot of Parasite sucking cane grub.

Other predaceous enemies helping to check the activities of greyback grubs include two or more species of robber flies and one of click beetles, the larvæ of which attack them in the soil, puncturing and sucking their life juices.

Species of carnivorous ground beetles and ants doubtless destroy a small percentage of these grubs; while during abnormally wet seasons many succumb to the insidious attacks of insect-attacking fungi and bacterial diseases.

In addition to the above-mentioned enemies, the common Bandicoot and other small native marsupials probably account for a minor percentage of grubs, whenever these chance to occur plentifully, or while they are feeding close to the surface, as often happens during very wet weather.

## DESCRIPTION OF MATURE GRUB.

After having finished feeding, about the end of April, its body has a somewhat plump look, and instead of being creamy white has now darkened to clayey yellow or old-gold colour, and becomes quite opaque. This change takes place about a week before the grub starts its downward journey into the subsoil in order to construct a pupal cell.

The plate for April illustrates cane sticks which have fallen, after being nearly eaten through by grubs; this may happen as a result of windy weather, or from the canes having been gnawed completely through laterally.

Four third-stage grubs are shown in the act of finishing off the basal portions of canes which still remain in the ground; while another grub is engaged in eating into an internode of a stick resting on the surface soil.

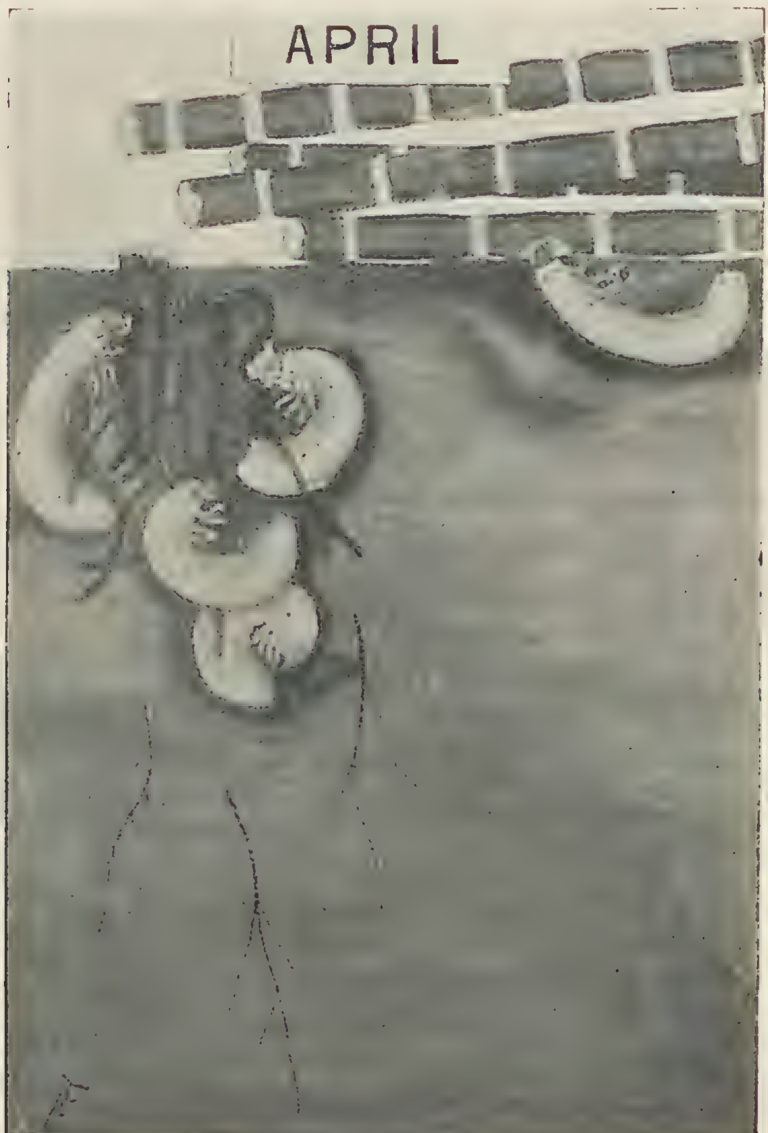


PLATE 30.

Cane sticks gnawed into by greyback grubs begin to blow over during April. Third-stage grubs are seen devouring the remains of sticks left in the soil, and gnawing into prostrate canes.

# Caterpillar Plagues in Grasslands and Cultivation Paddocks.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

IN most dairying districts localised outbreaks of cutworm or Noctuid larvæ are more or less well known to the farmer. Sometimes they may be confined to a small area of some 20 or 30 acres, while occasionally considerable tracts of land may be infested and the growing crops destroyed. During the summer of 1931-32 the Atherton Tableland suffered from coincident outbreaks at scattered centres so far apart as Atherton and Tarzali, Tolga and Butcher's Creek. About the same time reports from the Gympie district, investigated by W. A. T. Summerville, B.Sc., Assistant Entomologist, indicated that a considerable acreage of paspalum had been eaten out by one of the species operating in the North. Previously when such outbreaks have come under the notice of the Department the pest concerned has been *Cirphis unipuncta* Haw., better known as the army worm, and notorious as a pest of pastures and several cultivated crops, including sugar-cane, maize, and sorghum, for its host-plant range is a very wide one. Last year, however, two other species—*Spodoptera exempta* Walk. and *S. mauritia* Boisd.—were implicated, and a brief account of these will summarise the relevant data collected during the present invasion. *S. mauritia* was absent from the Gympie outbreak.

First reports came to hand just before the close of the year 1931, and the affected paddocks were then and for a further two weeks a seething mass of larvæ, sometimes stationary, more often moving as the available food supply was exhausted. Pastures were for the most part affected, perhaps because the main centres of the outbreak lay in essentially dairying belts. At the Atherton end of the Tableland, however, maizegrowing is the principle farming activity, and part of the crop suffered, while the incidence of the pest at the time presaged large-scale losses. Fortunately, the epidemic phase extended over only a single generation, and thereafter the pest ceased to be of any serious consequence

Most cutworm outbreaks have in the past taken place during the spring and summer months, when growing conditions are good. Were they to happen later in the year the position in pastures would be much more serious, for an early recovery would be exceptional, and the shortage of feed would coincide with a period in the year when the ordinary resources on the farm are already severely taxed. As a rule, however, pastures attacked early in the year rapidly improve and, while the losses may be inconvenient, adjustments in stocking will normally save the situation until such time as feed is again available on the attacked pastures. When the centres of attack are located in the maize belt the position is more difficult, for the nature of the wet season is such that, should a growing crop be destroyed, replanting cannot always be undertaken with any certainty of success. The loss actually depends on the date of the attack. Should this be in December or early January, replanting after an epidemic has subsided may yield a payable crop; but a crop sown at a later date would, perhaps, be best regarded as additional green feed for stock rather than as a source of grain.

### Host Plant Relationships.

Among the pasture grasses, paspalum (*P. dilatatum*) alone suffered, this being the most widely distributed fodder grass in the affected areas. It is curious that in mixed stands containing Kikuyu grass (*Pennesetum clandestinum*) and *Panicum muticum* both these grasses were passed by and remained unaffected, while seedling trees within the host-plant range also escaped. In the Gympie area paspalum suffered most severely, but some loss was also experienced in Rhodes grass paddocks. Normally, cutworms may attack a wide range of host-plants, and the species have been reared successfully in the laboratory on a number of grasses passed over in the field. There can be thus no doubt concerning the generalised tastes of the species of *Spodoptera*, and the explanation of their restriction to a single host probably depends on the nature of the food supplies available during the early life of the pest. Thus, if schooled in early larval life to consume a particular host, the larvæ will exhibit a preference for this so long as it is available. Should the initial host-plant be exterminated, an alternative may serve for the completion of development, but, provided the former exists in readily available supplies, the preference will be clearly exhibited—i.e., so long as the first host-plant is not one on which the pest can only be reared with difficulty.

In pastures the larvæ may consume any part of the flag, and sometimes the whole may be destroyed if the larval population per unit area is high. At a lower level of infestation the stems may be chewed at ground level, and the subsequent collapse of the herbage may actually cause an equivalent loss to the farmer. In such cases the dead grass may be raked together by hand as in pastures subject to grass grub (*Oncopera* sp.) attacks. Both types of injury can be located in any one attack, the second being on the outer edge of the affected area, and the consequence of attack when the epidemic is subsiding.

The injury to maize entirely depends on the age of the crop which is attacked. If the plants are young and succulent they may be eaten to the ground; otherwise, only the flag suffers, and the loss in leaf surface directly affects cobbing, though the measure of the loss varies with the stage reached in that process. Precobbing attacks would thus be more serious than post-cobbing, for the weight and the size of the cob are influenced by the evenness and rate of growth in the precobbing stages.

### Field Observations.

By the time field observations were practicable the epidemic was on the wane, and the numbers of larvæ, though considerable, were by no means commensurate with the extent of the pasture losses in the first paddock examined. It was presumed, therefore, that the bulk of the larvæ in the plague generation had pupated, and a search for this stage was accordingly undertaken. Cutworms normally pupate in the soil, and, though odd pupæ were located in the mulch formed by semi-decayed grass, they were too few to represent the main population. Such a mulch was not at all widely spread, for some two years ago the army worm swept through the paddock and effected a very real improvement in its root-bound condition. Hence the upper inch or so of the surface soil was more or less free from accumulated humus. Though pupation may take place in the laboratory under almost any conditions, it was then presumed that in pastures denuded of grass cover and subject to high midday temperatures pupation would only occur under particularly suitable conditions. Such ultimately proved to be the case. Stock had been grazing on the paddock for some time, and eventually the pupæ

were found clustered together in the, as yet, moist dung masses. Often the pupæ were so closely packed together that individual pupal cells adjoined one another, and in many such dung masses larvæ about to pupate were associated with them. As many as fifty pupæ have been recovered from the one dung mass. There can be no doubt, therefore, that these offer especially favourable conditions for pupation, and that the larvæ readily seek them out. There is nothing peculiar in pupation as such, the earth or dung cell being unlined with silk as in most Noctuids.

The duration of the attack was in all recorded cases confined to a single generation; hence it must be presumed that the emerging moths represent a mere fraction of that latent in the previous larval population. Parasites doubtless play a part in effecting this limitation, for a Tachinid accounted for almost half of the pupæ taken in the field and subsequently reared in the laboratory. Curiously enough, few mummified larvæ were found at Gadgarra, though they were said to be common at the Atherton end of the Tableland, where the precipitation is much less. The combined effects of insect parasites and various entomogenous fungi must, therefore, be important in the field of natural control. Perhaps a greater, though less obvious, limitation results from the crowded conditions imposed on larvæ living under epidemic conditions. In the laboratory a single generation of *S. mauritia* was reared from egg masses laid in cages containing mated pairs under observation. Some of the first-stage larvæ were reared singly, others in groups of three or four, while the remainder were housed in large breeding jars. Adequate food supplies were maintained in all cases, yet the number of individuals in the groups, whether large or small, steadily diminished. The causes are not always obvious, but the main factor in these instances must have been cannibalism in some form or other. It may be complete—in which case no trace of the body remains other than the more chitinous structures—or it may be partial, following injuries which ultimately prove fatal to the sufferer. Whichever plays the larger part, there can be no doubt that a plague carries the germ of its own destruction, and that overcrowding, even when food supplies are adequate, plays a considerable part in the decimation of immature forms.

## The Nature of Epidemic Conditions.

The explanation of cutworm outbreaks is quite problematical. There seems to be no reasonable doubt that the fundamental cause is one which temporarily breaks down the normal host-parasite relationship and permits the rapid reproduction of the pest at the same time. Individual species possess very different requirements, which limit their distribution, and these are usually typical of their normal habitat. Were it not for seasonal variations, outbreaks would be liable to occur every year, but the necessary sequence of conditions favourable to an epidemic is quite rare; hence the sporadic outbreaks, with a subsequent return to normal numbers, following limitations imposed by the joint influence of parasites and climatic conditions less favourable to rapid multiplication. The temporary nature of the escape from normality is shown in the case of the Queensland pasture species by the fact that only rarely does the epidemic extend beyond a single generation.. Though inferences from the climatological data available would be quite unwarranted, a statement of the more obvious features surrounding the outbreak may be worth recording Mid-December temperatures following the usual pre-wet season storms were exceptionally high, and remained

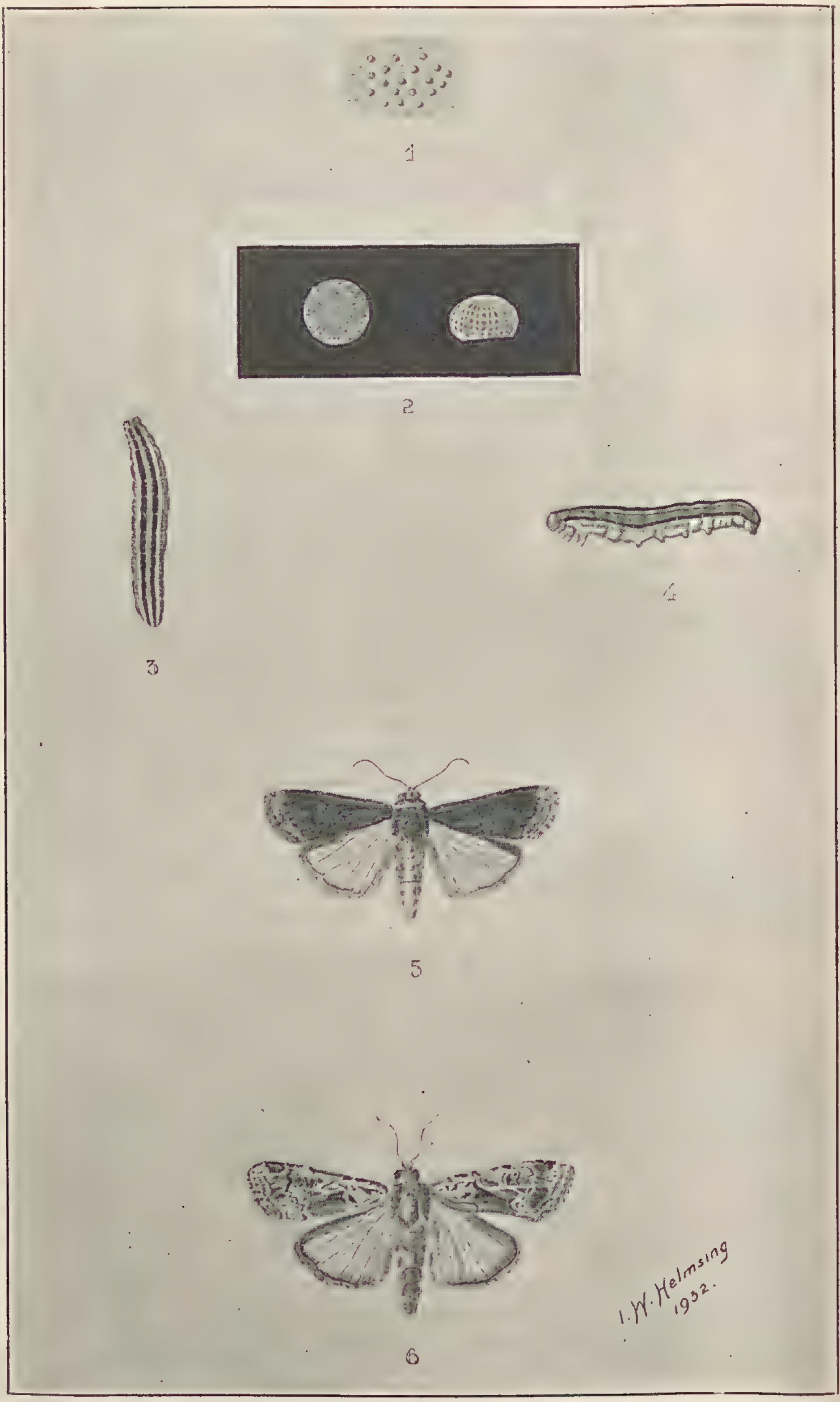


PLATE 31.

at this level until the 25th. Heavy precipitation followed, and continued more or less without intermission for a few days until 6th January, when high temperatures in the vicinity of 100 degrees maximum again were the rule. Between the two periods of high temperatures the humidities were above normal, and temperatures centred round the 80-degree mean maximum point.

## Laboratory Data.

The life-history of *Spodoptera mauritia* follows closely that of better-known species with similar habits. Eggs are laid in clusters containing one or two hundred bun-shaped individuals, over which are strewn reddish hairs detached from the female body. The clusters are arranged either on the ground or on the flag of the host pasture plant. From these eggs larvæ emerge, which commence to feed immediately. In the early stages these larvæ are almost devoid of colour, but later the distinctive features of the mature larvæ appear, these consisting of vivid linear stripes in various shades of green, some of them barred with white. When full grown pupation takes place—in the soil if this is suitable, but more often in the dung masses strewn over the paddock—and these in turn give rise to the free living adult. Exact information concerning the Queensland species is limited, and the following data drawn from the recent outbreaks is therefore relevant:—

From moths of *S. mauritia* (Plate 31; fig. 6) egg masses were secured, these having been laid on the linen cover of the jars enclosing them over turf carrying a mixed pasturage of *Paspalum platycaule* and *P. conjugatum*. In the field such masses would ordinarily be laid on the surface of the ground, or possibly on the lower leaf surfaces. Each egg mass contained some 200 eggs, amongst and over which were strewn the reddish hairs and scales shed by the female during oviposition. The eggs may be in a single layer, or more often in tiers, each egg being iridescent and pale-white in colour. In general appearance each egg mass had a reddish colour, due to the superimposed hairs. The diameter of the bun-shaped egg (Plate 31; fig. 2) is three millimetres, and the incubation period was seven days.

The first-stage larvæ are white save for the head and subsetal blotches, the typical colour of the mature larva only becoming distinct in the third stage. In the generation under discussion there were five instars prior to pupation, the mean duration of each being as follows:—

First stage—15th to 17th February
Second stage—17th to 21st February
Third stage—21st to 24th February
Fourth stage—24th to 25th February
Fifth stage—25th to 28th February
Pupal stage—28th February to 6th March

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PLATE 31.

*Spodoptera mauritia* Boisd.

Fig. 1.—Egg mass × 2½ (after Smith).
Fig. 2.—Egg, dorsal and lateral view × 25 (after Smith).
Fig. 3.—Larva, dorsal view, natural size.
Fig. 4.—Larva, lateral view, natural size.
Fig. 6.—Adult, natural size.

*Spodoptera exempta* Walk.

Fig. 5.—Adult, natural size.

totalling just under three weeks. The mass emergence of adults from bulk stocks followed closely that from individual specimens kept in separate containers, though in the former successive instars occurred together in any one observation.

The fifth (or final) stage larva is 2·5 to 4·0 centimetres in length, with linear stripes as follows:—Dull-green central stripe with lighter subdorsal adjoining bands; between the subdorsal and the wide green lateral bands in a milk-white line; spiracular band dull-green; sub-spiracular milk-white; venter pale-green; head marked dorsally with a brilliant white V.

### Control Measures.

Under ordinary circumstances outbreaks are not distinguished by any cumulative increase in the numbers of larvæ from generation to generation, each epidemic ending as quickly as it begins; hence farmers have considerable difficulty in devising ways and means of coping with a pest which bursts into the farm economy without warning, and, after effecting a great deal of damage in a very short time, disappears in much the same way. Once the pest appears a conjectural limit to the outbreak must be set, and for this purpose some discrimination must be used in deciding whether the further encroachment of new country is due to migratory forms from adjoining centres of infestation or merely the consequence of larvæ hatching from eggs laid *in situ* over a comparatively wide range. Protective measures have shown some success in the case of the former. For the latter special measures embodying liberal spraying are indicated, and these would only be practicable when the crop under treatment is of considerable value.

To counter migratory larvæ the usual practices are a combination of baiting and trapping methods. A deep furrow is ploughed as a line of demarcation between clean and infested parts of the crop in front of the line of advance of the species. A mould-board plough is most suitable for the purpose, as the straight face left by the vertically placed coulter acts as a soil wall, which the larvæ cannot climb. Paris green baits liberally applied along the line of the trench complete the destruction of the larvæ as they reach it. These baits must, of course, be used with discretion, and precautions must be taken to ensure that the food of man and animals is not contaminated by their application. Paris green is very poisonous; hence stock must be prevented from gaining access to the baits.

This method, though very useful in cultivated paddocks, proves less satisfactory in grass land, as the maintenance of an undisturbed furrow is much more difficult, while, quite apart from that, it is very difficult to observe the precise movements of the larvæ or estimate their limits in the field.

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## TO ROUGHEN CONCRETE FLOORS.

Etch surface with muriatic or commercial hydrochloric acid. Dilute 1 part acid to 5 parts water. Apply acid to floor surface and allow to remain until desired amount of roughness occurs. Then remove by thoroughly washing with water to prevent further action. A second treatment may be given if desired. Sprinkling ordinary ground limestone over the floor after cleansing also tends to prevent slipping.

# Preliminary Experiments on the Mass Treatment of Poultry for the Roundworm, *Ascaridia lineata* Schneider.

By F. H. S. ROBERTS, M.Sc., Entomologist.

A RECENT survey of the helminth parasites of the domestic fowl has shown *Ascaridia lineata*, the large roundworm of poultry, to be present in 76·6 per cent. of the birds examined. Its presence has been noted more in young chickens than in older birds. In chickens it may be not only responsible for heavy mortalities, but may also prevent their growth, weaken their constitution, and make them little resistant to other and perhaps more serious diseases. Older birds may carry a fairly heavy worm burden without showing any visible ill-effects, but such an infestation must at least seriously reduce their egg-laying capacity. The part played by these infested older birds as reservoirs of infection for young chickens must also not be overlooked.

The literature concerning the treatment of poultry for the removal of this roundworm resolves itself into—(*a*) mass or flock treatment, in which large numbers of birds are treated together by certain drugs given in the food; and (*b*) individual treatment, where each bird is treated separately. There is no doubt that the individual treatment of any animal with drugs is the more efficient method for the removal of infestation. However, as poultry farms usually run some hundreds of birds, and as the catching and individual treatment of each bird may become exceedingly tedious and probably costly, the use of a moderately efficient method of mass treatment may be warranted in the case of poultry.

Three methods of mass treatment for worms in poultry have been advised in other parts of the world—

(1) Feeding tobacco dust, containing 2 per cent. nicotine, in the daily ration for three weeks;

(2) Steeping finely-chopped tobacco stems in water, and feeding in a small quantity of wet mash;

(3) Feeding oil of chenopodium in a small quantity of wet mash.

These three methods have been critically tested on forty-two cockerels made available by the Poultry Advisory Committee..

The birds had been reared under worm-free conditions on concrete floors. When eight weeks old they were transferred to a battery with wire-netting floors. An examination of the fœces from each compartment showed no sign of parasitic infestation, and on 13th December, 1932, each bird was given approximately 700 viable embryonic eggs of *Ascaridia lineata*. Treatment was commenced on the 15th February, 1933, the period between infection and treatment being considered adequate for the worms to have reached maturity. The birds were divided into three lots of twelve and one lot of six. These groups were treated as follows:—

## Tobacco Dust Treatment.

At the time treatment commenced the twelve selected birds were all healthy, and showed no visible evidence of infestation. They were fed for

three weeks on a ration containing 2 per cent.. tobacco dust purchased as containing 2 per cent. nicotine. At intervals of ten days the birds were given a dry mash containing magnesium sulphate at the rate of 11 oz. for 100 birds.

On autopsy the birds showed a total of seventy-eight worms remaining. No pathogenic effects of the treatment were noticed at any time during the period of the experiment, and the birds did not seem to object to any great extent to eating the treated mash.

### Oil of Chenopodium Treatment.

A second group of twelve birds was given oil of chenopodium in a small quantity of wet mash. The quantity of chenopodium given was 3½ ccs., or approximately one teaspoonful. The group, after being starved for twenty-four hours, consumed the treated mash in about four hours. On autopsy six days after treatment sixty-nine worms were collected. No ill-effects of the treatment were noticed in any of the birds except in one case, when the intestine showed signs of mild enteritis. As a similar condition was shown by one of the control, untreated birds, it is probable that in the case of the treated bird the drug was not concerned.

### Steeped Tobacco Stem Treatment.

The third group of twelve birds was fed steeped tobacco stems, the treatment being conducted as follows:—The birds were starved for twenty-four hours, and then fed finely chopped-up tobacco stems at the rate of 1 lb. to 100 birds. The tobacco stems were steeped for two hours in just sufficient water to cover them, and then fed in a small quantity of wet mash. Two hours after this treated mash was eaten the group was given a small quantity of dry mash containing magnesium sulphate at the rate of 11 oz. for 100 birds. The treatment was repeated after ten days.

No difficulty was experienced in getting the birds to consume the treated mash. The birds were killed six days after the second treatment, and yielded a total of sixty-three worms.

On the second and third day after each treatment it was noticed that the fœces were flecked with blood, denoting a condition of acute intestinal congestion, and on autopsy three birds were noted to be severely affected.

### Control.

The fourth group of six birds was retained as an untreated control. The birds were killed at the conclusion of the experiment, and yielded a total of fifty-nine worms..

### Tabulation of Results.

The results of the experiment are expressed in the following table:—

| Group. | Treatment. | No. of Birds. | Worms Remaining. | Average Worms per Bird Remaining. | Efficiency. |
|---|---|---|---|---|---|
| 1 | Tobacco Dust .. .. .. | 12 | 78 | 6·5 | 34% |
| 2 | Steeped Tobacco .. .. | 12 | 63 | 5·2 | 47% |
| 3 | Chenopodium .. .. .. | 12 | 69 | 5·7 | 42% |
| 4 | Untreated .. .. .. | 6 | 59 | 9·8 | .. |

It is considered that groups of animals reared under similar conditions and fed an equal number of worm eggs would, providing the group is composed of an adequate number of individuls, show total infestations approximately equal. The number of birds (twelve) in the treated groups and (six) in the control group was thought large enough to overcome any inconsistencies that may have arisen from individual resistances. The percentage efficiency is computed as the average number of worms removed from each bird in each group as compared with the average number remaining in the controls. For example, in the group treated with tobacco dust the total number of worms remaining in the twelve birds was seventy-eight, an average per bird of 6.5. The total number remaining in the controls (six) was fifty-nine, an average per bird of 9·8. The percentage of worms removed is therefore—

$$\frac{9{\cdot}8-6{\cdot}5}{9{\cdot}8} \times 100=34.$$

### Discussion.

The results of this experiment cannot be regarded as at all satisfactory in view of the small number of worms infesting the various groups. It is difficult to account for such a small residual infestation after feeding approximately 700 eggs to each bird. The eggs appeared quite healthy, and were certainly in the infective stage. Better results would possibly have been obtained by feeding large numbers of eggs daily for some days. The worms collected from the birds were all small and immature. *Ascaridia lineata* is said to reach maturity in about fifty days. The immature worms present eighty days after infection would therefore denote an extreme resistance exhibited by the birds to infestation. As the birds were approximately three months old when infested, this resistance may have been due to age, as an age resistance among chickens to *Ascaridia lineata* has been demonstrated.

The appearance of blood in the droppings of the group treated with steeped tobacco would tend to suggest that under certain circumstances this treatment cannot be regarded as safe, and until further investigations are made should not be recommended, even though it has shown the highest efficiency of the methods used.

In view of the good results obtained by workers in the United States of America from tobacco dust, those obtained in this test are very disappointing. That the tobacco dust used, although purchased as containing 2 per cent. nicotine, showed only ·86 per cent. on analysis is no doubt responsible for the comparatively low efficiency of the treatment. The use of 2 per cent. tobacco dust for a three-weekly period appears reasonably safe, but as its efficacy entirely depends on the nicotine content every attempt should be made to obtain a standard dust containing 2 per cent. nicotine before any recommendation is made. If this is done its use may be recommended as a matter of farm routine, but the period of treatment is considered far too long where cases of heavy infestation are encountered.

Under the circumstances of the experiment, oil of chenopodium may be regarded as a safe drug which may be depended upon to shift a percentage of the worms present. The small percentage removed indicates at least three treatments at ten to fourteen days intervals.

## MINT WEED *(Salvia lanceifolia)*.

By E. H. GURNEY, Senior Analyst.

OWING to the increased growth of this weed, particularly along stock routes, experiments were conducted at Pittsworth for the purpose of determining the effect of some weed destroyers upon this plant.

The substances "Weedex" (*Calcium chlorate*), Ferrous Sulphate, and common salt were used, as being non-injurious to stock.

The spraying of the weed was done on small areas—viz., 405 square feet—and Mint Weed was practically the only plant growth on these areas. The growth of the weed was very similar in each area, ranging from 1 inch to 12 inches in height. Owing to previous rain there was a profuse growth of weed, but at the time of spraying—3rd November, 1932—it was warm weather and in places the surface soil was dry. This dryness of soil was evidenced by the fact that with the smaller growth the leafage of the weed was more or less wilted, but with the larger growth occurring in different patches throughout the areas where moisture still existed the leaves were in a healthy state and not wilted.

The quantities of weed destroyer used on the different plots are given below. Also, if such quantities were applied at the same rate per acre, the cost of the weed destroyer per acre:—

| | lb. | Gallons of water. | Strength of solution. Per cent. | Cost of material used per acre. £ s. d. |
|---|---|---|---|---|
| 1. Weedex | 2 | in 2 | 10 | 3 9 10 |
| 2. Weedex | 2 | in 4 | 5 | 3 9 10 |
| 3. Weedex | 1 | in 4 | 2.5 | 1 14 10 |
| 8. Weedex | 2.2 | in 1 | 22 | 3 16 10 |
| 4. Ferrous Sulphate | 2 | in 2 | 10 | 1 7 2 |
| 5. Ferrous Sulphate | 4 | in 2 | 20 | 2 14 4 |
| 9. Ferrous Sulphate | 8 | in 3 | 26.6 | 5 8 8 |
| 6. Salt | 2 | in 2 | 10 | 0 13 0 |
| 7. Salt | 4 | in 2 | 20 | 1 6 0 |
| 10. Salt | 8 | in 3 | 26.6 | 2 12 0 |

Inspector H. McBean, Pittsworth, inspected and reported on the results of these spraying experiments.

The first report was made ten days after spraying, and the second report was made five weeks after spraying. The following are Inspector McBean's reports of the different plots:—

*First Report*—14th November, 1932.

1. Tops of the mint partly dead and dying.
2. Tops of the mint partly dead and dying.
3. Tops of the large mint partly dead, small plants not affected.
8. Mint plants dying (best results).
4. Plants not affected.
5. Plants not affected.
9. Plants not affected.
6. Top of the mint partly dead.
7. Top of the mint partly dead.
10. Top of the mint partly dead and dying.

*Second Report*—9th December, 1932.

1. Portion of mint dead, portion only top leaves dead, rest making good growth, and young plants coming up in hundreds.
2. Ditto.
3. Plants unaffected, about 14 inches high.
8. Portions of plants dead, other portions showing new growth on old stalks.
4. Plants unaffected, about 14 inches high.

5. Plants unaffected, about 14 inches high.
9. Unaffected.
6. Plants unaffected, about 14 inches high.
7. Portion of plants dead in places, other plants unaffected.
10. Portion of plants dead in places, young plants growing thicker than ever.

When the results obtained in these experiments are reviewed it will be noticed that the Ferrous Sulphate did not affect the growth of the Mint Weed in any way; that the stronger solutions of ''Weedex'' and salt killed only some of the plants; and that such solutions in other cases only killed the top leaves of the sprayed plants; and that on all the plots new and vigorous growth of the weed ensued.

It should be stated that in the time between spraying and reporting results 437 points of rain fell.

From these experiments it is concluded that the destruction of Mint Weed on any large areas with the non-poisonous to stock materials mentioned above is quite impracticable.

It may be stated that the Council of Scientific and Industrial Research is having inquiries made as to the possibility of the biological control of Mint Weed.

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## QUEENSLAND SHOW DATES, 1933.

Dalby: 5th and 6th April.
Beenleigh Campdraft: 8th April.
Oakey: 8th April.
Chinchilla: 11th and 12th April.
Boonah Campdraft: 17th April.
Miles: 19th April.
Nanango: 20th and 21st April.
Tara: 26th April.
Kingaroy: 27th and 28th April.
Goondiwindi Campdraft and Show: 28th and 29th April.
Taroom: Campdraft, 1st; Show, 2nd and 3rd May.
Wondai: 4th and 5th May.
Boonah: 3rd and 4th May.
Monto: 3rd and 4th May.
Blackall: 9th to 11th May.
Charleville: 9th and 10th May.
Beaudesert: 10th and 11th May.
Mundubbera: Abandoned.
Mitchell: 17th and 18th May.
Murgon: 11th to 13th May.
Ipswich: 16th to 19th May.
Goomeri: 18th and 19th May.
Gayndah: 17th and 18th May.
Kilkivan: 22nd and 23rd May.
Roma: 23rd to 25th May.
Gympie: 24th and 25th May; Campdraft, 27th May.
Toogoolawah: 26th and 27th May.
Kalbar: 27th May.
Maryborough: 30th and 31st May, and 1st June.
Callide Valley: 2nd June.
Marburg: 3rd to 5th June.
Childers: 5th and 6th June.
Wowan: 8th and 9th June.
Bundaberg, 8th, 9th, and 10th June.
Lowood: 9th and 10th June.
Gladstone: 14th and 15th June.
Rockhampton: 20th to 24th June.
Mackay: 27th to 29th June.
Laidley: 28th and 29th June.
Bowen: 5th and 6th July.
Gatton: 5th and 6th July.
Ayr: 7th and 8th July.
Townsville: 11th and 12th July.
Caboolture: 13th and 14th July.
Rosewood: 14th and 15th July.
Nambour: 19th and 20th July.
Charters Towers: 19th and 20th July.
Esk: 21st and 22nd July.
Ingham: 21st and 22nd July.
Atherton: 25th and 26th July.
Cairns: 25th to 27th July.
Maleny: 26th and 27th July.
Pine River: 29th July.
Royal National: 7th to 12th August.
Crow's Nest: 23rd and 24th August.
Home Hill: 1st and 2nd September.
Mary Valley: 1st and 2nd September.
Nerang: 13th October.

## DAIRY CATTLE IMPROVEMENT.

"IT is apparent that a misconception exists in the minds of many dairy farmers as to the objects of the Dairy Cattle Improvement Act, while many are apprehensive of the attitude to be adopted in the administration of the Act," said the Hon. F. W. Bulcock, Minister for Agriculture and Stock, in the course of a recent Press interview.

Continuing, he said that at the initial meeting of the Dairy Cattle Improvement Board held at the Department early in March, it was considered desirable that many dairy farmers generally should be made acquainted as early as possible with the salient features of the Act, which would immediately remove the feeling of doubt existing in many quarters, and replace it with a feeling of confidence. In this connection it was interesting to note that on every occasion where the principle and objects of the Act had been explained to dary farmers, they had accorded the scheme their enthusiastic support.

The Minister explained that under the Act all bulls in dairying districts had to be licensed at a fee of 5s. per annum, but that bulls used solely in the breeding of beef cattle may secure exemption on application. It should be particularly noted, however, that for the first two years all bulls will be licensed irrespective of type, and that not till after this period of two years has elapsed may licenses be refused, and the gradual elimination of nondescript and worthless types of animals be begun. This should reassure dairy farmers that no bulls will require to be discarded for the next two years, and even then the types of bulls to be eliminated in the early years will be merely unsuitable and nondescript animals.

"It should be remembered, however," added Mr. Bulcock, "that the license fees were required to be placed in the Dairy Cattle Improvement Fund, which has to be utilised solely in the service of dairy farmers in the improvement of their herds. The Production Recording Scheme of the Department is being extended with the co-operation of butter factory directorates and managements, and all dairy farmers may thus take advantage of the free facilities offered in the testing of their cows for production. This is a service for which dairy farmers in other States and countries are required to pay from 3s. to 6s. per cow.

"The Department also assists dairy farmers to secure approved sires by defraying the cost of the railway freight, which in itself is a valuable service, the maximum rebate being equivalent to the license fee for forty years.

"Dairy farmers will also secure an improved veterinary service in the control of the health of stock.

"The Dairy Cattle Improvement Board has indicated to me that it is preparing a scheme of activity securing the co-operation of Local Producers' Associations for the dissemination of information among the members, and thus extending the educational activities of the Dairy Branch of the Department."

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## PIG RECORDING.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

THE time has arrived when pig breeders require some better guide than pedigree and appearance in the selection of breeding stock. Dairy cattle breeders and poultry breeders have had the use of production records in the selection of the stock for years past, and have been able to effect considerable improvement in their stock as a result. The pig breeder must be supplied with similar information if he is to maintain or improve the productivity of his pig herd.

Although our show societies have done a great deal of good encouraging the breeding, exhibiting, and distribution of good pigs, and have tried to eliminate the low-producing animal, we still have a basis of appearance and pedigree only on which to judge our pigs, productivity being practically overlooked because there has been no efficient method of judging it. Purebred prize-winning stock are no better than mongrel stock unless they have a greater producing power.

There is no better means of advertising breeding pigs than by submitting them to a test of production which is controlled by an official body and which would distinguish the low producers from the high producers, thus providing the stud breeder and the ordinary breeder with a guide to selection.

To supply pig breeders with an authentic record of the production of their breeding pigs, recording schemes have been put into operation in most of the important pig-raising countries, and the Queensland Branch of the Australian Stud Pig Breeders' Society has moved in this direction in so far as it has co-operated with the Department of Agriculture and Stock in preparing a proposed scheme of pig recording for Queensland stud-pig breeders. The proposed recording scheme is as follows:—

The measure of production to be the total litter weight and number of pigs in the litter at eight weeks old.

At the commencement, the recording to be confined to the herds of stud-pig breeders, and to be voluntary.

All breeding sows on the property to be tested for a period of twelve months.

The recording authority to have the right to publish records of all purebred litters and this to be done periodically in agricultural and live stock papers.

Notification of the expected birth of a litter to be sent to the recording authority fourteen days before expected; birth and notification of the actual birth of the litter to be sent to the recording authority within fory-eight hours of such birth.

The recording officer to be provided with weighing scales and to have the right of access to the breeders' property at all times to check, mark, and weigh pigs.

Litters to be weighed as near to eight weeks as possible, and the actual weights and the adjusted weight to eight weeks to be recorded by the officer.

A certificate of performance to be supplied to the owner of each sow tested.

The stud breeders have approved of this work being initiated and are seeking the assistance of the Department of Agriculture and Stock.

The records thus obtained should give valuable information regarding the prolificacy and milking capacity of breeding stock and the growth of young pigs, and if it can be successfully worked the recording scheme may later be extended to the testing of representative pigs from recorded litters at an officially-controlled experiment station, where all pigs would be fed similarly and marketed when they reached maturity as porkers, light baconers, and export porkers. Thus a record could be obtained of economy of feeding, the rate of growth, and the suitability for the trade for which the pigs had been bred.

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## WEIGHT-FOR-AGE PIG CLASS AT BRISBANE SHOW.

A new class has been included in the pig section of the Royal National Association schedule covering the 1933 Brisbane Royal.

With weight-for-age conditions governing it, some excellent data should be provided for the industry, for fast-growing litters of pigs eminently suitable to the pork trade are sure to be in the majority, and an object-lesson for breeders who are desirous of participating in such trade will be presented.

Each exhibit in this new class is to consist of all the pigs of any one litter which, on judging day, weigh 90 to 120 lb. each alive. To enable inspection and marking by a representative of the Association, nominations for the contest must be made not less than fourteen days before the birth of the litter, and notification of the date of birth of the litter must be forwarded to the secretary within twenty-four hours of such birth. Each litter must have been sired by a registered boar.

The prizes will be:—First, £10 10s. and trophy; second, £5 5s.; third, £2 2s.

Points will be allotted in accordance with the following scale:—Suitability of pigs for pork-trade requirements up to 100 points. Litter weight for age—5 points for each 1 lb. weight per day—i.e., total litter weight on judging day divided by number of days of age and multiplied by five.

Prizes will be allotted to the exhibits awarded the greatest aggregate.

## THE QUEENSLAND PIG INDUSTRY.

THE belief held by certain bodies associated with the pig industry in Queensland, that the system of organisation of the industry in this State was by no means complete, and that the time was opportune for a review of the whole structure surrounding the pig and allied industries in Queensland, formed the principal subject for debate at a conference of representatives of the pig industry in Queensland recently, and at which the Minister for Agriculture and Stock, Hon. F. W. Bulcock, M.L.A., presided.

The conference was comprised of representatives from the following interests:—Queensland University, exporters, manufacturers and distributors, agricultural organisations, producers, Government departments, and others including stock-selling agents.

After referring to the apparent need for organisation in the pig industry, Mr. Bulcock said that, after giving full consideration to the matter, an agenda paper had been prepared on the most comprehensive lines for consideration by delegates. It was significant, he continued, that although the pig industry was one of the oldest in the world, that industry had received the least attention of all, more particularly the economic side of it, and it had reached the stage when the pig must have certain specific characteristics in order to make the carcass acceptable to the public.

### Research Work.

Under the recent system of reorganisation it is proposed (under the Director of the Animal Health Station) to engage in experimental work on some of the problems surrounding the pig industry such as nutrition, disease, &c. It is hoped that this work will be of considerable value to the industry.

He pointed out that the fundamental necessity as far as the growers are concerned, is to get a fair and equitable return for the labour they put into their work, and the capital involved. The existing legislation had been used by other branches of agriculture to advantage, and the same legislation could be applied to the pig industry.

Others who addressed the conference included Mr. E. E. Forth, (J. C. Hutton's Proprietary, Limited), Mr. R. G. Watson (Australian Stud Pig Breeders' Society), Mr. J. Barker (Pig Fatteners), Mr. J. A. Heading (Queensland Bacon Association, Limited), Mr. W. Krimmer (Darling Downs Co-operative Bacon Association, Limited), Mr. J. P. Bottomley (Royal National Association), Mr. J. F. McRobert (Council of Agriculture), Professors E. J. Goddard and J. K. Murray (of the Queensland University and Gatton College), Dr. Vickery (Council for Scientific and Industrial Research), Mr. A. H. Cory (Chief Inspector of Stock), and E. J. Shelton (Senior Instructor in Pig Raising).

### New Council Formed.

Conference agreed with the Minister on the necessity for organisation, and it was finally resolved that the name of the new organisation be the Queensland Pig Industry Council.

It was decided that the council consist of the following representatives:—

TRADE REPRESENTATIVES (5).—One each being appointed by the following:—Queensland Meat Industry Board, meat exporters, co-operative bacon factories, proprietary bacon factories, stock-selling organisations.

PRODUCERS' REPRESENTATIVES (6).—One each being appointed by the following:—Pig fatteners (suburban pig farmers); Council of Agriculture (one for North, Central, and Southern Queensland); Australian Stud Pig Breeders' Society; Chamber of Agricultural Societies.

GOVERNMENT REPRESENTATIVES (5).—One each being appointed by the following:—Meat Export Branch (Commonwealth); Director of Marketing (State); Instructors in Pig Raising (State); Animal Health Station (State); Queensland Agricultural High School and College (State).

TRANSPORT (2).—One each from the railways, overseas shipping companies, and one each from the Queensland University and Council for Scientific and Industrial Research, the Department of Agriculture and Stock to provide a secretary.

In thanking delegates for their attendance, the Minister stated that anything that could be done for the development of the industry must be done in the interests of the State as well as in the interests of those engaged in the industry. He thought that the council that had been appointed would be of great service to the pig industry. He was of opinion that the big maize-producing countries of the world would become the large pig-producing countries. He assured delegates that when the deliberations of the council reached him he would give them the utmost sympathy and consideration, and he would always be pleased to place his officers at the disposal of the council and the industry as a whole.

# SILOS AND SILAGE.

By A. E. GIBSON, Instructor in Agriculture.

OWING to the numerous requests for information received by this Department relative to silos, it has been deemed advisable to reprint this article which appeared in the July, 1925, issue of the Journal.

Question 1.—What is the best form of silo?

Answer.—A properly roofed and watertight cylindrical structure of reinforced concrete built overground and having an internal chute for emptying purposes in preference to doors.

Question 2.—Which is the better plan? Having the height greater than the diameter or vice versa?

Answer.—Silage rapidly depreciates when exposed to the atmosphere; consequently in order to reduce surface exposure to a minimum the diameters of silos are reduced as much as possible, whilst the height is increased in order to give a greater pressure to the silage for the purpose of compaction and consequent exclusion of air from the silage. Usually the proportion of height to diameter is 2 to 1 respectively, and is found to be economically preferable to those in which the height compared to the diameter is at a higher ratio, say, 2½ or 3 to 1.

Silos which are excessively high require greater strength in foundations and walls, apart from which higher power and more expensive machinery is necessary for the filling.

Question 3.—Or is there any specific proportion between diameter and height?

Answer.—This question is really answered under Answer 2, but, whilst there is no distinct or specific proportion between diameter and height, it must be clearly understood that as the diameter increases to the ratio of the height so is the density of the silage decreased unless some form of artificial pressure is used.

Question 4.—Which is the best silo? Above ground level, below ground level, or half and half?

Answer.—Although it is admitted that the filling of a pit or underground silo is extremely economical and can be effected with a minimum amount of machinery and labour, the process of emptying the silage therefrom is the most costly and strenuous of all forms of silos. The overhead silo, whilst requiring a little more power and machinery for the filling, is the most economical of all when it comes to the operation of emptying. The silo which is half above and half below ground level has all the drawbacks of the pit and overhead silo, whilst only possessed of half the benefits of the latter.

Briefly, the merits of the three silos may be summed up as follows—

Pit Silo.—Economical in filling, expensive in emptying (it requires the services of two operatives to empty a pit silo).

Overhead.—Slightly more expensive, due to increased power and machinery in the process of filling, but is decidedly economical in the process of emptying.

Half aboveground.—Costs practically the same to fill as an ordinary overhead silo, and is as cheap to empty down to ground level. From that on the cost of emptying becomes greater with the depth below surface.

Question 5.—Give dimensions for building a 50-ton silo.

Answer.—Silo internal diameter 11 ft. 6 in.; height, 23 ft. 3 in.

Question 6.—Give quantities for making same.

Answer.—For a 50-ton silo, using a 4-2-1 mixture—i.e., four parts of broken stone, two of sharp sand, and one of cement—you would require:—Cement, 70 bags; stone aggregate (¾-in. gauge), 14 2/5 cubic yards; sharp sand, 8 cubic yards; reinforcement, 2 coils 36-in. K-Wire netting, 10 gauge; rendering, 1 in. inside and out, 2½ cubic yards sand; 36 bags cement. Roof specifications depend on style adopted (gable or octagon).

Question 7.—How would you work out the necessary information from Answers 5 and 6 to enable one to build (*a*) larger silo, (*b*) a smaller silo?

Answer.—Diameter 2 $\times$ .7854 $\times$ height $\div$ 48 $=$ tons capacity. Diameter $\times$ 3 1/7 $\times$ height $\times$ thickness of wall in feet $\div$ 27 $=$ cubic yards contents of wall.

Based on the proportions of 4-2-1—i.e., four of stone, two of sand, one of cement. To each cubic yard of concrete 540 lb. of cement are required (4½ bags). Of aggregate (stone) broken to gauge (in this instance ¾ in.) nine-tenths of 1 cubic yard are required and ½ cubic yard of sharp sand.

The cement and sand together do not appreciably increase the bulk of the concrete, as they fill up the interstices in the aggregate.

Rendering (inside and out) is calculated at 2 to 1 (2 of sand and 1 of cement). This will give a sufficiently watertight job without the addition of water-proofing material.

Question 8.—What acreage of maize will fill a 50-ton silo?

Answer.—This, of course, depends on the crop; also the manner in which it was sown—i.e., broadcast or drilled. Under ordinary circumstances the quantity required should be easily obtained by the cultivation of 5 acres of maize sown in drills—which method is recommended at all times in preference to sowing broadcast.

Question 9.—How is a silo filled?

Answer.—By a power-driven elevator of a similar pattern to that used on chaff or grain elevators, slats of timber being substituted for cups, or by blower—the latter being simply a fan blast driven at a high rate of speed with delivery pipes of 6 in. and upwards led directly into the silo at the top. More power is required to a ''blower'' than an elevator. Whatever system is adopted for the purpose of conveying the chaffed green material from the chaff or silage cutter to the silo must make provision for its equal distribution. Where chaffed maize is indiscriminately fed into a silo, the tendency will be found for the heavier (stalk) portions to lodge in the centre, whilst the lighter (leafy) class of material accumulates around the walls.

Unless this is thoroughly incorporated with the heavier class of fodder in the subsequent fermentation which takes place, uneven settlement results. The centre, by reason of its greater solidity, does not settle to the same extent as the outside or lighter material; consequently a shrinkage from the walls occurs, admitting air, which, once fermentation has lessened, brings about a gradual decay of all the exposed surfaces of the silage.

To overcome this, all material fed into silos must be evenly incorporated and tramped tightly along the walls, and around all doors of internal chutes. To do this thoroughly necessitates the presence of a competent and reliable operative in the silo during entire filling operations. Note that all doors that come in contact with the silage must be rendered airtight. This can be effected by covering them with tarred brown paper.

Although the question was not asked by the correspondents, it is thought that a few points on emptying will not be amiss.

When emptying use a strong-toothed rake, and rake evenly from the top the amount of silage required for the daily ration. At all times avoid digging into the bulk of the silage. Remember that the more even and level the surface of the silage is left after each daily ration is obtained, the less decomposition and consequent waste will occur. If your silo has doors fitted to it, keep them closed; there is then less strain on the hinges and the doors (which are weighty) would fit more snugly when refilling, apart from which there will be no chance of rain destroying the silage, for nothing tends to bring about the decomposition of silage quicker than the admission of either air or water.

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**If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.**

# A NEW TYPE OF REINFORCED SILO.

A. E. GIBSON.

THE attention of farmers and stockowners who contemplate the erection of a silo for the purpose of fodder conservation is drawn to the new type of reinforced cement silo, a specimen of which has recently been erected near Beenleigh and inspected by the writer. The following particulars are made available for the information of those interested in any form of silo construction:—

It is in connection with silos that emphasis is placed upon the advantages which this process bears in contrast with the reinforced concrete system.

Briefly, some of the advantages are—

(*a*) Saving in cost and freight or cartage of gravel or broken stone.

(*b*) No special forms or moulds required, which are more or less costly to manufacture or transport.

(*c*) The internal diameter of silo can, if desired, be enlarged or decreased without difficulty.

(*d*) No costly mixing plant or heavy labour of concrete mixing involved generally in the construction.

(*e*) Cost of construction considerably cheaper.

With the exception of the base or floor of the silo, the whole of the construction of the walls and roof consists of reinforced cement, fibre, and sand, referred to as the compo.

In erecting, the base of reinforced concrete is laid slightly in excess of the outside diameter of the finished silo, and in conformation is somewhat similar to that of an inverted saucer, with the thickness of concrete immediately below the walls. The reinforcement consists of galvanised No. 8 wire meshed and led out to the circumference of the base for the purpose of splicing with the external reinforcing wires referred to later on.

Upon this base is built a hollow cylindrical structure of 6 by 1 pine boards placed vertically and kept in position by templates suitably spaced.

An outside scaffolding is erected that will permit of the compo. being applied efficiently. A compo. of asbestos fibre, cement, and sand is applied to the outside face of the cylinder and is floated over the whole of the wooden surface to a depth of ¼ inch. Following on this coating a reinforcement of wire-netting 1½ inch by 16-inch gauge is applied with the selvedge placed horizontally. A rendering of sand and cement compo. is then applied, which is followed by another line of reinforcement of similar material and cemented as before, and finally the outside wires spliced to the reinforcing wires of the base are led to the top of the silo in a diagonal direction and a rendering of compo. applied. The final coating may be roughcast or smooth finish as desired. Doors of cement bevelled edged and fitted to a corresponding bevel cast in the silo walls are provided, or if preferred an internal chute can be constructed. The roof may be of the same type of construction as that of the walls or may be of the usual wood and iron gable construction associated with reinforced concrete silos. Where the roof is constructed of reinforced cement, it is cone-shaped, and provision is made for the admission of the top of the elevator by means of a gable built into the roof.

The illustrations show a silo in the course of construction, built for Mr. J. W. Davidson on his farm at Beenleigh, and when photographed represented the work of two men for a period of three days, which will serve to show the rapidity with which a silo of this type can be constructed.

As a cheap, efficient, and lasting type of silo, Winterburn's patent should appeal to those contemplating the erection of a modern silo, the agents for which are the Queensland Fibro Cement Construction Co., 16 Victory Chambers, Queen street, Brisbane.

PLATE 32.—Top view of silo. Note position of boards forming mould.

PLATE 33.—Close-up of reinforcement being applied; part of which has received a coating of compo.

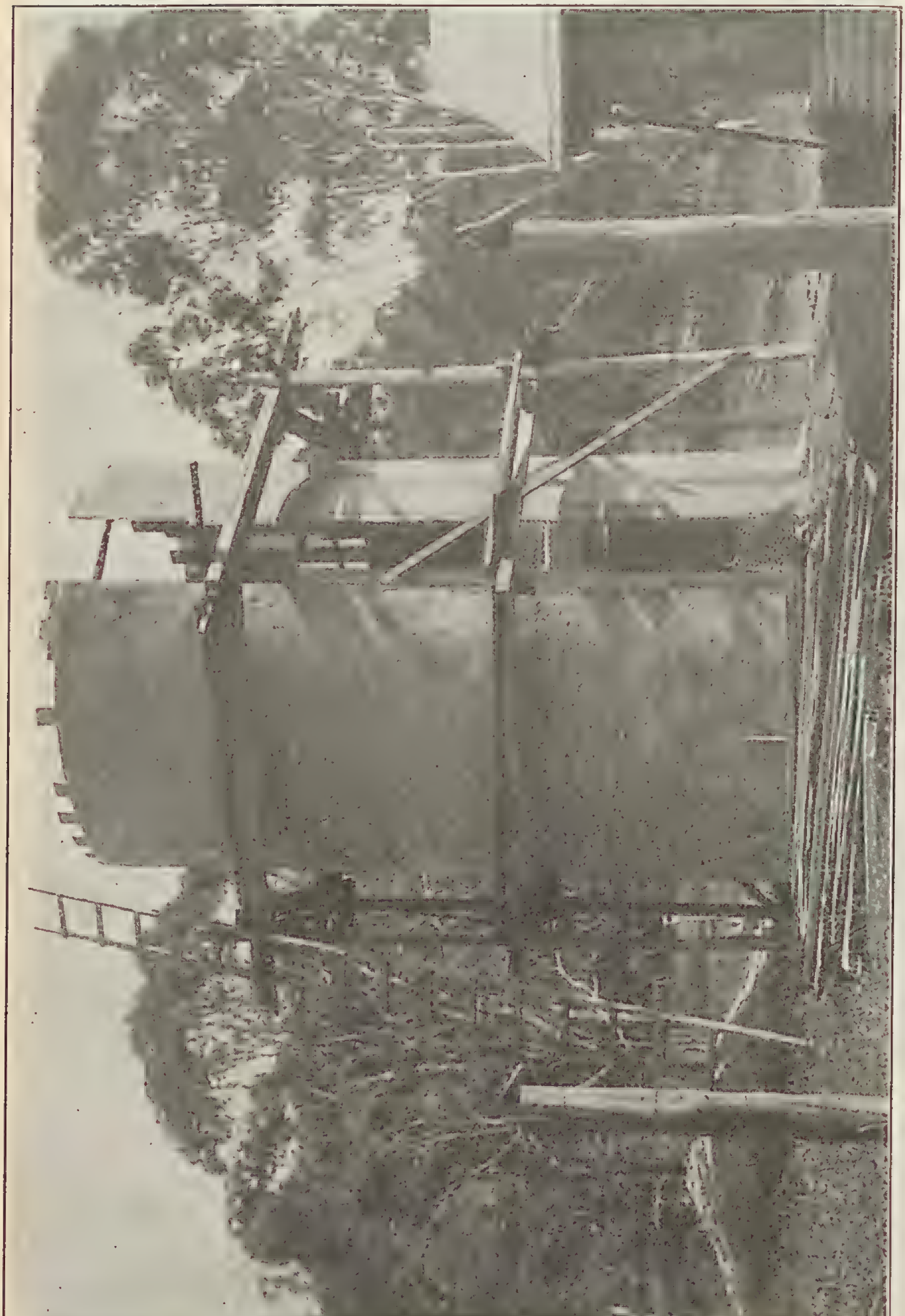

PLATE 34.—General view of silo in course of construction; the result of three days' work by two men.

PLATE 35.—MORNINGSIDE HOME PROJECT CLUB.

The Morningside State school is the only city school at which a rural project scheme is in actual operation. The picture was taken on the occasion of a visit of club members to the Department of Agriculture and Stock. In the centre of the group, seated, is the Minister (Hon. Frank W. Bulcock, with the Director of Education, Mr. B. McKenna, on his left, and Messrs. W. J. Copley, M.L.A., and W. Krause (teacher in charge) on his right. Departmental officers standing in the rear rank are: Left to right, Messrs. J. F. Reid (Editor, "Q.A.J."), G. B. Brooks (Director of Agriculture), and on the extreme right, Miss May Bryant and Mr. R. Wilson (Assistant Under Secretary).

# In Memoriam.

## GEORGE WILLIAMS.

WIDESPREAD regret was felt at the passing of George Williams, Director of Fruit Culture in the Department of Agriculture and Stock, on Friday, 10th March. He was sixty-one when the end came after a long illness borne with extraordinary fortitude and a cheerfulness that was an inspiration to those in close association with him. In fact, it may be said that it was his indomitable will that kept him alive during the last year of his life. With remarkable courage he attended to the work which was his lifetime vocation up to within a few weeks of his death; and so he died, as he desired, practically in harness.

There was no better known or more highly respected man in Queensland horticulture than George Williams. He joined the Department of Agriculture as Inspector of Plants at Rockhampton in 1899, and subsequently served in the Cairns district, where his extensive knowledge of tropical fruit culture, both as an instructor and as an experimentalist, was a factor in the firm establishment of the fruit industry in the far North. While in North Queensland he also had much to do with the establishment of the citrus-growing industry at Charters Towers and other places. He was appointed Assistant Instructor in Fruit Culture in 1913, Instructor in Fruit Culture in 1922, and Director in 1928.

To his official life the late George Williams brought the fidelity, integrity, breadth of outlook, and thoroughness that characterised his private life. To him, "the reward of a thing well done is to have done it." His interest in progressive horticulture was deep and genuine, and his generosity in passing on to others the information drawn from a wealth of experience and keen observation in the nursery and orchard was proverbial.

Fruitgrowers throughout the State have, from time to time, paid tribute to the valued services of George Williams during his long association with the Department. Endowed with an attractive and genial personality and innate courtesy, he enjoyed a wide popularity, not only among those interested in the fruit-growing industry, but also among all classes of the community, and especially his fellow officers.

Banana-growers, particularly, will miss the benefit of his character, ability, and sound judgment as Chairman of the Queensland Banana Industry Protection Board; while for the fruit industry generally he performed notable service as Government representative on the Committee of Direction of Fruit Marketing.

In his younger days, he took a very keen interest in the Volunteer movement, firstly as a member of the Port Curtis Infantry, and afterwards as Officer Commanding the Machine Gun Section in the 15th Australian Light Horse. He was also an expert rifle shot.

The late George Williams was laid to rest in the Lutwyche cemetery on Saturday, 11th March, in the presence of a large gathering of citizens, which included representatives of every section of the fruit industry and commercial community, as well as many of his fellow officers of the Department. Expressions of sympathy were received by the bereaved family from all parts of the State, and they included messages from the Hon. Frank W. Bulcock (Minister for Agriculture and Stock) and former Ministers of the Department, Hon. W. Forgan Smith (Premier) and Mr. Harry F. Walker.

Plate 36.

The Late George Williams.
Director of Fruit Culture, Department of Agriculture and Stock.

PLATE 37.—DEGILBO SHIRE.—GOOMERI-CHILDERS ROAD, ROCKY CREEK CAUSEWAY.

PLATE 38.—GLENGALLAN SHIRE.—TOOWOOMBA-WARWICK ROAD.
Cement penetration on heavy black soil—built to test comparative values of this or the heavy macadam type of construction.

*[Photos.: Main Roads Commission.*

# Answers to Correspondents.

## BOTANY.

### Saffron Thistle.

"Thistle" (Nanango)—

The specimen is *Carphamus lanatus*, the Saffron Thistle, a native of the Mediterranean region, now found as a weed in most of the warm temperate regions of the world. It has been established in Queensland for some time, but fortunately does not seem to have spread to any great extent. It is very abundant in parts of New South Wales, and some graziers say that it makes quite good fodder when very young, but soon loses its value, growing up with a hard stem and prickly leaves and becoming quite useless.

The plant is a noxious weed and should be destroyed as soon as it makes its appearance.

### Pigeon Grass.

W.C.R. (Kilkivan)—

The specimen is one of the Pigeon grasses, *Setaria australiensis.* The Setarias are also sometimes referred to as Scrub Panicums, though *Panicum* is a botanical name of a restricted group of grasses. The term "Panicum" is sometimes used in agriculture to denote grasses which are distinct in a botanical sense from the genus *Panicum.* The Setarias make fairly good forage for stock.

### Groundsel.

L.D. (Cooroy)—

The specimen forwarded is *Baccharis halimifolia*, the Groundsel Bush, a native of South America, now a common naturalised weed in coastal Queensland. It is particularly abundant on lands near the coast, and especially those subject to tidal inundation. Of recent years, however, it has spread on to scrub farms, and unless checked can become a very great nuisance. It was thought to be poisonous to stock, but feeding tests carried out at the Animal Health Station, Yeerongpilly, gave negative results. At the end of the experiment the animals fed on the plant were very emaciated, thus showing the plant to have no fodder value, but they recovered when put on to ordinary herbage.

### "Dairy Grass," "Elephant Grass."

C.G.H. (Buneru, Dawson Valley)—

The specimen proved to be *Eriochloa punctata*, a native grass common in parts of Queensland. "Dairy Grass" and "Early Spring Grass" are two vernaculars that have been applied to it. There are several forms of it in Queensland, and most of them are excellent fodders.

Elephant Grass has considerable value as a stock fodder, and it not known to be poisonous or harmful at any stage of its growth.

### Cheese Making.

J.W.R. (Toowoomba)—The Supervisor of Dairying, Mr. C. McGrath, advises:—

1. As milk for cheesemaking is paid for on the basis of its fat content, the addition of water to the milk would be of no advantage to a milk supplier.
2. The adding of water to the milk is detrimental to the cheese, owing to it causing interference with its curdling properties under the action of rennet. The quality of the water, if it is contaminated by bacteria may, moreover, seriously affect the quality of the cheese.
3. The lactometric test, which merely shows the specific gravity of the milk, is not a reliable test for added water in milk.
4. For the reasons given in answer to Question 2, water added to milk by one or several suppliers would be detrimental to the quality of the cheese made from it.

It may be mentioned that selling or supplying milk to which water has been added is an offence under both the Dairy Produce Act and the Health Act.

# General Notes.

### Staff Changes and Appointments.

Constable W. J. Ridge, Mourilyan, has been appointed also an Inspector under the Slaughtering Act.

The Officer in Charge of Police, Thangool, has been appointed also an Acting Inspector of Stock.

Mr. Leslie Wright, Curator of the City Council Nursery, at Cairns, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act, in respect of the Oyster Cay Sanctuary.

Mr. A. F. S. Ohman, Government Veterinary Surgeon, has been appointed also an Inspector under and for the purposes of the Brands Acts.

Mr. R. J. B. Barton, Habnarcy Crossing, New Angledool, New South Wales, has been appointed an Acting Inspector under the Queensland Diseases in Stock Acts.

Mr. H. B. Carney, Ingham, has been appointed Chairman of the Macknade and Victoria Local Sugar Cane Prices Boards, *vice* Mr. J. A. Murray, resigned.

Constable H. Nuss, of Herberton, has been appointed also an Acting Stock Inspector.

### Egg Board Election.

The following nominations have been received at the Department of Agriculture and Stock in connection with the election of five growers' representatives on the Egg Board:—

District No. 1 (Caboolture-Bundaberg).
Ronald Benjamin Corbett (Woombye). Returned unopposed.

District No. 2 (Brisbane North-Redcliffe).
Arthur Alfred Cousner (The Gap, via Ashgrove).
Henry Ernest Probert (Fig Tree Pocket, Indooroopilly).

District No. 3 (Brisbane South-Cleveland).
Tom Hallick (Mount Gravatt). Returned unopposed.

District No. 4 (Moreton).
Alexander McLauchlan (Boonah). Returned unopposed.

District No. 5 (Darling Downs).
Walter Thomas Hughes (Middle Ridge, Toowoomba).
Frederick Michael Proellocks (Wyreema).

The elections where necessary will be by postal vote, and the date fixed for the return of the ballot-papers is on or before the 28th April.

### Canary Seed Board Election.

Following is the result of the Canary Seed Board election:—

| | |
|---|---|
| George Burton (Cambooya) .. .. .. .. .. | 145 votes. |
| Garrett Denis O'Neill (Allora) .. .. .. .. | 121 votes. |
| Michael Coleman (Allora) .. .. .. .. .. | 120 votes. |

The elected members will hold office as from the 1st March, 1933, to the 31st May, 1934.

### Pig Husbandry School.

Professor J. K. Murray, Principal of the Queensland Agricultural High School and College, Queensland, advises the intention of the college to arrange a further school of instruction to pig farmers some time during the winter months, if sufficient inducement offers. These schools have become very popular among those fortunate enough to attend, and as the fees charged really represent only a minimum for board and lodging, and as concession fares are available on the Queensland Railways to students attending the school, expenses are reduced to a minimum.

Those attending are assured of a really good and profitable time. Early application for particulars is advised. Address letters to the Principal, Queensland Agricultural High School and College, College Siding, Gatton, Queensland.

### Citrus Levy Regulations.

Executive approval has been given to the issue of Regulations under "*The Fruit Marketing Organisation Acts*, 1923 *to* 1930," empowering the Committee of Direction of Fruit Marketing to make a levy for the purposes of the said Acts on all citrus fruits marketed for the year ending 28th February, 1934.

The Regulations provide that the levy shall be payable by growers of citrus fruits on the basis of the quantity of fruit marketed, and shall be at the following rates:—

1. Five shillings per ton on all citrus sold or consigned, whether by rail, road, or boat, to factories.
2. Three shillings and two pence, with a minimum of 1d., on all citrus sold or consigned by rail to any agent, person, or firm in Queensland, other than a factory.
3. One penny per case on all citrus sold or consigned other than by rail to any agent, person, or firm, except a factory.

The levy shall be deemed to have been made upon publication by the Committee of Direction of particulars of such levy.

All agents or persons who at any time hold moneys to the credit of growers shall pay to the Committee of Direction the amount of levy payable by the growers concerned.

The levy on all citrus railed from any Queensland railway station (other than Toowoomba, Townsville, Rockhampton, Central, Roma Street, Brunswick Street, Wooloongabba, and South Brisbane) to any other railway station in the State, may be collected by the Commissioner for Railways to the extent of 3s. 2d. per ton.

Subject to the above, and except as hereafter provided, the levy in the first instance shall be collected—

(1) On all citrus sold or consigned to factories—

(*a*) If by rail, to the amount of 1s. 10d. per ton;

(*b*) If not by rail, to the amount of 5s. per ton.

(2) On all citrus sold or delivered otherwise than by rail to any agent, person, or firm, other than a factory, at the rate of 1d. per case.

The levy shall be collected in the case of agents or persons other than the Committee of Direction or the Railway Commissioner, by means of levy stamps, obtainable from the Head Office of the Committee of Direction, Brisbane, which shall be affixed to account sales. Such agents or persons shall be entitled to deduct the value thereof from moneys held to the credit of growers, and levies so collected shall be paid to the Committee of Direction, Turbot street.

In the case of citrus fruits sold privately by the grower (that is, citrus not delivered to any agent or sent away by rail), the grower must furnish the Committee of Direction with a monthly statement of sales, and pay the levy at the Head Office.

If the amount of levy is not collected by the Railway Commissioner or by the agents or persons concerned, then without prejudice to the liability of the Commissioner or agent, such shall be payable by and recoverable as a debt from the grower.

Any agent, person, or firm who or which receives citrus fruits for sale on commission shall permit any authorised officer of the Committee of Direction to inspect their books and accounts.

The sums raised by the levy shall be expended in the interests of citrus-growing industry.

The levies on factory citrus and fresh fruit have been in force for some years past, and it was only last year that the arrangements with the Railway Commissioner to collect the levy on behalf of the Committee of Direction were entered into.

### Slaughtering Regulations Amended.

Approval has been given to the amendment of a number of regulations under the Slaughtering Act. The amendments have reference to the use of the term "owner or occupier" when referring to the person in charge of a slaughter-yard or butcher's shop, and specify more definitely the "person" concerned.

A further amendment provides that fees for the inspection of carcases at slaughter-houses shall be paid on the last day of each month, instead of monthly or at shorter intervals as required by an inspector, as provided in the old Regulation. An addition also imposes a penalty up to £50 on an occupier who fails to pay such fees to an inspector within thirty days after same become due.

### Honey Board Election.

The following nominations have been received at the Department of Agriculture and Stock in connection with the election of four growers' representatives on the Honey Board, namely:—

Roy John Bestmann (Caboolture);
Alexander Roy Brown (Park Ridge);
Charles William Edwards (Greenbank, via Kingston);
Henry Edgar Fagg (South Killarney);
John Schutt (Holstein Park, Perthton);
Owen Norman Tanner (Samford); and
George Herbert Whiting (Coowoonga, via Rockhampton).

The election will be by postal vote and the ballot-papers are returnable to the Department not later than the 10th April.

### Sanctuaries Proclaimed.

Orders in Council have been issued under the Animals and Birds Acts declaring as sanctuaries the G.W. Swamp, situated on Gunnawarra Station, Mount Garnet, and Malvern Downs and Talagai Holding, near Capella. Talagai was declared a sanctuary in 1928, but its boundaries have now been altered, and the new sanctuary includes Malvern Downs. It will be unlawful for any person to take or kill any animal or bird on these properties.

### Stallion Districts.

A proclamation under the Stallions Registration Acts has been issued, and provides for the abolition of existing stallion districts, and for the creation of nine new districts in which the provisions of the Acts shall be in force. These embrace the East Moreton, West Moreton, Darling Downs South, Darling Downs North, Wide Bay, Burnett, Central Coast, Northern Coast, and Northern Districts.

### Sugar Mill Suppliers' Committees.

Executive approval has been given to the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts, which alters the list of Mill Suppliers' Committees appearing in the Act by providing for the deletion of the Homebush-Farleigh, Childers, Alberton, Carbrook, and Stegelitz Mill Suppliers' Committees. The Homebush-Farleigh Mill Suppliers' Committee is now part of the Racecourse Mill Suppliers' Committee, and the Childers sugar mill having ceased to function, the Childers Committee hase become part of the Isis Central Mill Suppliers' Committee.

### Banana Industry Protection Board.

A Regulation has been issued under "*The Banana Industry Protection Act of* 1929," which provides that for the period until the 30th September, 1933, the two growers' representatives on the Banana Industry Protection Board, in lieu of election, shall be nominated by the Committee of Direction of Fruit Marketing from the Banana Sectional Group Committee. Messrs. A. E. Maher (Cooran) and K. H. Hack (Nerang) have accordingly been appointed Growers' Representatives on the Board until 30th September, 1933.

### Maturity Standard for Apples.

Executive approval has been given to an amendment of Regulation No. 3 under "*The Fruit and Vegetables Act of* 1927," which prescribes a new maturity standard for apples. Matured fruit, therefore, in the case of apples, will mean when, in the opinion of an inspector, the fruit has attained its full growth as indicated by the normal ripe colour of the skin of the variety, and matured its seeds as indicated by these having changed from white to a brown colour.

### Financial Statements by Butter and Cheese Factories.

A Regulation has been issued under "*The Dairy Produce Acts*, 1920 *to* 1932," which provides that an owner of a butter or cheese factory shall, on or before the 30th September in each year, supply to the Minister copies of financial statements, which shall be for the year ending on the preceding 30th June. These statements shall be in the form and contain the particulars prescribed in the Schedule to the Regulation. A certificate of correctness signed by the auditor of the factory's books must be appended to the statements.

# Rural Topics.

## A Queensland Cattleman Abroad.

Cunnamulla Charley, the seasoned hero of dozens of Queensland cattle-drafting competitions, whose steer-handling feats are the glory of the stations from Boulia to the Downs, and whose buckjumping is epic, has been for a trip to the United States, whither he had gone to see what real rodeos and Texan "long-horns" were like. Cunnamulla Charley is quite disillusioned regarding the much-written about marvels of the Yankee cattle camps. "I never saw a real scrub steer, as we understand it, all the time I was away! Their beasts are as spiritless as a Yandina dairy cow, and they'd do no good at an Esk cattle draftin' unless it was as runners-up in a cud-chewing competition. That 'ud be about their weight!"—The "Brisbane Courier."

## Lucerne as a Soil Renovator.

" If you grow lucerne as a rotation crop you can, even after forty years, leave your farm to your sons in just as rich a condition—perhaps richer—than when you originally purchased it," observed Mr. A. S. Pankhurst, of Singleton, in advocating the growing of this crop at a recent farmers' conference. It was not only a most valuable soil renovator, said the speaker, but it produced such a bulk of nourishing fodder that was capable of being conserved for such a lengthy period that it could could with every justification be called the king of fodders.

## Importance of Stirring Cream.

Stirring of cream two or three times daily helps to maintain it in good physical condition and to liberate any gas which may form. If the cream is left standing for hours before stirring there is a tendency for the heavy portion (casein, &c.) to gradually settle towards the bottom and for the fat to rise to the top, especially if the cream is inclined to be thinly separated. This is not desirable, and stirring will prevent it.

A tinned steel or tinned copper stirrer should be used; on no account should a wooden stirrer be employed for this purpose.

## A Whitewash Formula.

A whitewash suitable for many purposes on the farm can be made as follows:—

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise above the water in a dry powder it will "curdle." Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 lb. to 14 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained, and, if desired, may be applied whilst hot.

## Green Feed for Poultry.

Succulent green feed, chaffed up for preference, should be given daily to poultry, preferably at midday. If a little pollard is mixed with it, and it is wet, the green stuff is eaten up more readily. Among the best crops to use are lucerne, Bokhara clover, barley, rape, chou moullier, thousand-headed kale, and green maize while young and tender. This range of green crops will provide feed throughout the whole year.

## Wood Ashes as Fertilizer.

The value of wood ashes as a fertilizing material is not as widely known as it deserves to be. In newly-cleared country this valuable substance is produced in large quantities, and it will be found to more than repay the trouble of returning it to the land. It is a matter of common observation that after a bush fire the vegetation is particularly strong and luxuriant, and the effect is due largely to the lime, potash, and phosphoric acid thus returned to the soil. The household wood fires also furnish a small but constant supply of ashes which should be all kept and made use of. They may be utilised, either by themselves or mixed with other manures, or added to the compost heap—a valuable adjunct to the economy of the farm.

**Snakes—What to do if Bitten.**

All people whose daily routine is likely to bring them in contact with snakes should see that the following articles are with them or in a handy place:—(1) Crystals of permanganate of potash; (2) a sharp knife, razor, or lance; (3) some cord or elastic that can be used as a ligature. Immediately following the bite of a venomous snake—the sooner the better—a ligature must be placed above the bite marks on the side nearest the heart (writes J. R. Kinghorn in Melbourne ''Argus''). This ligature must be twisted until the patient thinks his finger or arm or leg is being cut in two, a painful but necessary operation.

If the bite is on a finger or toe the ligature can be applied to that member, as near to the hand or foot as possible, provided room is left to enable the operator to work at the punctures. If the bite is on the wrist or forearm or calf of the leg the ligature must be placed above the elbow, or knee, where there is only one bone, thereby enabling the blood flow to be checked.

As soon as this is done wipe away any venom or saliva that may be on the surface of the skin, then make deep longitudinal cuts through each fang puncture; these should be deeper than the punctures. Into these cuts force some crystals of permanganate, then squeeze the wound to force out as much of the poisoned blood as possible. If there are no cracks, cuts, or abrasions on the lips or in the mouth of the operator he may safely suck the wound, washing the mouth with a weak solution of permanganate the while. If any venom is accidentally swallowed, no harm will result if a little weak permanganate solution is swallowed and as long as the stomach is healthy and free from inflammation.

If the bite is on a part of the body where a ligature cannot be applied—the face, for example—do not place a ligature round the neck, but as much of the above treatment as possible must be faithfully adhered to. As soon as the first-aid treatment is completed, send for or take the patient to a doctor, and if he finds the treatment has been ''well done'' he will know that his chance of pulling the victim through has been greatly enhanced.

If no doctor is available the ligature must be loosened at the end of about half an hour to lessen the danger of complications setting in; it must be loosened for a minute or so, and then tightened again, and the performance repeated again after about fifteen minutes, and again after fifteen minutes more, and so on, removing it altogether after the third or fourth operation.

Do not go to the extremes of cutting off a finger or toe—the result might be worse than that of the bite. Do not beat a patient to keep him awake, or do not walk him about and tire him. Complete rest is essential, and a stimulant, such as coffee or a little alcohol, should be given. Alcohol, ammonia, &c., either applied to the wound or taken internally, have no curative effect whatsoever. Only small doses should be given; large doses are dangerous, as they dull the nerves or quicken the circulation, both of which should be avoided.

*Treatment.*

1. Apply ligature to localise the effects of venom.
2. Wipe venom or saliva from surface of wound.
3. Cut the flesh to drain away poisoned blood.
4. Apply permanganate.
5. Squeeze or suck the wound.
6. Send for a doctor.

The doctor is placed last merely because every second is valuable, and first-aid treatment must not be delayed.

Bites from non-venomous snakes may be washed with a solution of permanganate of potash, and hot fomentations applied to the wound. Unless one makes a close study of snakes it may be difficult for the layman to determine at a glance a non-venomous from a venomous snake. The bite marks differ considerably, though occasionally there may be a few small punctures or scratches behind the large fang marks of a venomous snake bite; so for safety's sake all unknown species had better be regarded as venomous unless the bite marks distinctly show it to be harmless.

Finally, remember this—do not reach into a hollow log or a rabbit burrow, even though you saw a rabbit enter, because very often a tiger or brown snake is there also, and it will get your hand before you get the rabbit.

### Sheep and Wheat.

Sheep must be regarded as indispensable on the wheat farm. They are valuable not only as an important and reliable source of income but as part of the working plant of the farm for the control of weeds, &c.—their indirect value is frequently of greater importance than the cash return. It is essential to the success of the crop that the farmer have on his holding as many sheep as possible, compatible with the most economical use of the land for wheat production.

Sheep are valuable on the following grounds:—

They consume and turn to profit the straw left after the harvest.

They turn weeds to profit and prevent them from seeding at times when the farmer is unable to deal with them, owing to pressure of other work.

Their manure improves the fertility of the land.

When the season is so bad that the crops fail to produce grain, sheep turn them to profitable account.

The income from the farm is rendered more certain, as the farmer does not then depend entirely upon a crop that may be destroyed by fire or hail.

Sheep necessitate the adoption of a rotation, which tends to improve the fertility of the land and to increase the yields of the crops.

They can be used to feed off crops that need such a check.

A supply of cheap mutton is made available for the farmer's own household.

To these advantages might be added the pride and pleasure derived by a farmer from the possession of a good flock.—A. and P. Notes, N.S.W. Dept. Agric.

### Watering Horses—Important Points.

Horses require anything from 5 to 15 gallons of water a day, the quantity depending on the temperature and the amount of work performed. The water should be as pure as possible, clear in appearance, and free from taste, colour, or smell. Pure water is just as essential to a horse as it is to a man, and it is a mistake to suppose that a horse can drink badly contaminated water with impunity. Water obtained from pools or shallow wells, contaminated with surface drainage, or containing decomposing organic matter, frequently causes diarrhœa, and generally predisposes to colic. Water that contains a large amount of sediment should not be given, as the sediment causes a mechanical irritation of the mucous membrane of the stomach and intestines—i.e., sand colic.

When the horse is at rest in the stable, water should be given three times a day, and should invariably be given previous to feeding. This latter point is of considerable practical importance. A horse's stomach is small in proportion to the animal's size, and water does not remain in it, but passes through the stomach and small bowel to the cæcum, or water-gut. If water is given after feeding, besides weakening the digestive juices, a considerable portion of the food in the stomach and small intestines will be washed out in an undigested state, and indigestion and colic may result. Water in small quantities can be given within an hour or so from the completion of feeding if desired.

After a long journey, a good plan is to water a mile or so before the journey's end, and take the horse slowly in afterwards. This prevents chills and colic, due to the ingestion of a large quantity of water when in an exhausted state. An animal after prolonged exertion or fast work has his system depleted of fluid. He will not eat sufficiently until his thrist has been satisfied; therefore the water should come first, and while the animal is still warm is the best time to give it. After standing, the body temperature falls, and to give cold water freely then is only to intensify the effect of the cold water on the system.

### Danish Pig Carcases.

Arrangements are being made by the Royal National Agricultural and Industrial Association of Queensland to exhibit at their coming exhibition in August, 1933, frozen carcases of pigs for bacon typical of those most favoured on the British markets, representative of the class of product imported from countries other than Australia. The objective is to secure also data concerning these carcases—weight, breeding, feeding, &c.—and to display them alongside specially selected Australian carcases. Negotiations are in train with a shipping company for refrigerated space to bring such carcases to Brisbane in time for the show. It is considered that a display of this type would provide the Queensland grower with excellent opportunity to sum up requirements of the overseas bacon trade.

**Lucerne—Rate and Method of Sowing.**

The quantity of seed necessary when sowing lucerne varies. In the regular lucerne districts of the State from 12 lb. to 15 lb., and even 20 lb., per acre is applied. For dry districts, such as the Riverina, 6 to 8 lb. will be found quite sufficient if evenly applied. For grazing purposes in dry districts 2 to 3 lb. seed per acre is ample.

It is not wise to run the risk of a thin crop through a little parsimony in seeding. It is all-important, with a permanent crop such as lucerne, that a good stand should be obtained at the outset. Re-seeding cannot be done without again breaking up the land, and this means that a year or more is lost. If re-seeding is not done, the yields are permanently affected through the poor stand. Attempts are sometimes made to remedy unsatisfactory stands by sowing further seed, but they are seldom successful. The soil is not in a receptive condition, and what plants do grow have to contend with established vigorous plants.

At the same time it is a mistake to endeavour to remedy defects in preparation, or in the state of the soil, by heavier seeding. Favourable conditions are required to promote germination and help the young plant, and seeding should only be done after they have been obtained. If the ground should happen to be dry at seeding time, heavier seeding will not secure a proper stand.

Farmers generally prefer to broadcast the seed where the area is small, but sowing through the grass seed attachment of the wheat drill is a useful method when the area is larger.

A method of sowing that is well suited for wheat districts is to mix thoroughly just prior to sowing 70 lb. of superphosphate with the lucerne seed, and put the mixture into the manure box of an ordinary seed drill, or the combine. The discs or hoes of the drill should not be set into the soil too deeply. Some drills, especially when new, cannot be set to a shallower depth than 1½ to 2 inches; in such a case a good plan to follow is not to set the lever of the drill into the first notch but to let it dangle. The cogs of the drill will be in gear, but the hoes will not go down as deeply as if the lever had been set into the first notch. In this way the seed will be sown about ¾ inch deep.

Only a small quantity of the mixture should be put into the fertiliser box at a time—it should not be filled right up. In order that the seed may be thoroughly covered, it is advisable to attach a light tine harrow or brush harrow to the back of the drill. An even distribution of the seed is required, and although some farmers are sufficiently expert to obtain it by hand-sowing, this method is not recommended to the inexperienced. Many good hand-broadcasting machines are available which do the work satisfactorily.

If a farmer is compelled to resort to hand-broadcasting, half the seed should be sown in one direction across the paddock and the other half at right angles across the first cast, so that strips missed the first time will receive some seed. A calm day or early morning should be selected, as it is hard to distribute the seed evenly on a choppy, windy day. The seed should be covered with a light harrow, though a brush harrow is often used. Adjustable lever harrows are very effective for this work, as the depth can easily be regulated. The seed should not be covered deeply, and precautions must be taken to prevent a crust forming on the surface.—A. and P. Notes, N.S.W. Dept. Ag.

**Money in Pigs.**

The total amount paid to pig suppliers from inception of the company to the end of 1932 by Norco Co-operative Association, Limited, Byron Bay, New South Wales, represents an expenditure of £2,782,207 18s. 8d.

The largest number of pigs treated in one year was 53,552, the supply for the year 1932, approximately 3,000 more pigs than in previous year, representing approximately ten times the number per year in comparison with the first year's supply, that of 1895, when but 5,070 pigs were killed.

Up to the end of 1932, 1,013,216 pigs had been killed at Norco's factory with business still at a very high level, despite the fact that the prices paid in 1932 were the lowest for many years. An average price of 4.89d. per lb. was paid for A1 pork with a further distribution of ½d. per lb. on all A1 and No. 1 grades for the half-year; the bonus for the previous half-year already had been paid.

# The Home and the Garden.

## OUR BABIES.

*Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.*

### LESSONS IN MOTHERCRAFT.

RECENTLY a class of High School girls watched a demonstration given by the matron of one of the New Zealand Karitane Hospitals and a group of Karitane nurses. The demonstration illustrated the bathing and dressing of a normal baby, the making of the cradle and putting the baby to bed, and it was followed by a talk from the matron about the simple essentials needed for keeping the well baby well. Afterwards a prize was offered for the best essay on the lesson. How readily and thoroughly mothercraft teaching like this is understood and assimilated is well illustrated by the essay which we print. Hardly a point has been missed. Time and again this fact is brought home. One wonders how long we shall continue to have our girls prepared for almost every conceivable profession or occupation except the only one which the majority will be called upon to practise—motherhood, "woman's exclusive profession."

### ESSAY BY HIGH SCHOOL GIRL.

On Wednesday the matron of the Karitane Hospital, assisted by three Karitane nurses, gave us a very interesting and beneficial lecture and demonstration on the correct method of bathing and clothing baby and preparing his bed.

**Bathing the Baby.**

Before bathing baby, one should have all the appliances at hand, so that there will be no delay, thus causing unnecessary exposure of the skin. If one has not a bath thermometer to test the heat of the water, dip the elbow into the water, and if the heat is comfortable for the elbow it is the correct temperature for bathing baby. Wash baby's face gently with a cloth, using no soap; dry thoroughly. Then, using as little soap as possible, wash the head and the body; then gently lower baby into the bath and wash the soap off. Bathing time is not a play-time, and the bathing should not be delayed or the baby played with during this time, as delays are dangerous, and through exposure baby may contract a serious cold.

When baby is taken out of the bath, he should not remain exposed, but should be dried quickly with gentle dabbing movements rather than rubbing. Great care should be exercised in the drying of the eyes, ears, and folds of the skin. When baby is dried, a little powder, although unnecessary, may be applied at the mother's discretion, but it should be used in small quantities, as it will close the pores of the skin if too much is used. After baby becomes older the bathing water should gradually be decreased in temperature so that in time he may be able to have a cold sponge or bath.

The correct time to bath baby is just before his 10 a.m. meal or his first meal for the day; but if this cannot be managed, at least one hour should elapse after feeding-time before baby is bathed. A cosy corner in the room should be chosen for bathing purposes, and, if necessary, a draught screen should be used.

**What the Baby should Wear.**

After baby is bathed he should be dressed immediately. Baby should never wear flannel next to his skin, because it is of rough texture and it is irritating, often causing chafing and the outbreak of rashes. All the garments should be hung from the shoulders, and not from the waist. Elastic bands should never be made use of, because they tend to stop the circulation and sometimes cause deformities.

A thin, soft, porous cotton material should be worn next to the skin, then a soft woolly shirt, then a flannel petticoat of the cheapest quality, as the cheaper flannels are more open in the weave and are not so liable to shrink when washed, a loose flannel dress or some other open material, and, lastly, a little flannel jacket. These garments give the mother plenty of scope for her artistic sense. The amount of clothing worn by baby should be regulated by the mother according to the warmth or coldness of the atmosphere. A bib of some absorbent material is essential, otherwise baby would be soaked in no time. The napkin, made preferably of towelling, should be loose, but not bulky, and only one should be used, as bulkiness causes deformities. There should be no space for the chilly air to enter between the napkin and the singlet. In cold weather, or if baby is delicate, flannel booties and gloves should be used to prevent chills. All the Karitane patterns for baby's clothes are simple, loose, flowing garments, and easily made.

### The Baby's Bed.

The preparation of baby's bed is highly important, as baby in his early stages requires plenty of sleep, which he cannot obtain if his bed is uncomfortable.

A wicker basket cradle is perhaps the best type of bed. At the head of the cot is the head blanket, and on top of this the enveloping blanket; on this rests the mattress. If a hot bottle is necessary, it should be placed on top of this mattress to prevent any chance of accident. On top of this is placed a loose chaff mattress, composed of about 4 lb. of chaff. The casing can be washed if it is at any time soiled. Into this baby nestles, whilst the hard mattress prevents deformities and helps to strengthen baby's back. On the chaff shakedown should be placed a small piece of old flannel blanket. The pillow, also made of chaff (about ½ lb. to 1 lb.), should then be placed at the head of the cot. Baby's clothes should then be neatly folded back, and he should then be laid on his side in the bed. Over him should be placed another blanket, which should be tucked neatly and snugly around him. Then the two sides of the enveloping blanket should be tucked securely under the mattress; the end should be turned up neatly so as to form a cosy bed. Over this is placed a dainty quilt. Baby should then be left to sleep in the open air. If this is not possible, he should be put in a large, airy room.

## TREATMENT OF THE ONLY CHILD.

In giving advice about the treatment of the only child for application in the home, we need to consider whether that home is in the city, small town, or isolated in the "outback."

There are two main points that parents should remember—first, that all educationists and psychologists, who differ on many points, agree on one, namely, that the main time for forming character is before six years of age. After that, training and environment still count, of course, but not to the same extent.

The second point refers especially to the only child, or one leading the life of the only child, and is, that man is a social being.

### Companionship Necessary.

Companionship with children of his own age, or better still, of his own stage of development, is a necessary part of a child's life. Without it he may become mal-adjusted, the usual term being a "spoilt child." Adjustment really means the natural process of learning the law of "give and take," forming the ability to take part as a harmonious unit in a crowd, gaining judgment and balance, taking a few hard knocks without running to elders for help; in fact, as men put it, "getting the rough edges taken off." What a vitally important part of the training of a young child it is! In the light of future citizenship, it means that the plastic child is learning to co-operate, to work for the good of the whole community, and to gain a grasp of the great law of interdependence, which, if every small child in every nation could gain it, would stop war. The kindergarten graduate is thinking of these great principles when she guides a tiny tot of three years to see that, instead of fighting another child about who will have a certain part of the floor to build a train, it is much better for one child to build the train while the other builds a station and goods-shed. Thus erstwhile opponents share the coveted area in harmonious, constructive activity for a common end. Yet the average adult, watching this scene, would call it "only play." Outside kindergarten a small boy can often grasp the law of interdependence by being shown what a joy it is when daddy's

car, having broken down on the road, several other motorists stop and help him. You will find many other instances—remember the great principles involved and use them.

### In the City.

The best solution of the "only child" problem in a city is to send him to a nursery school or kindergarten, if for only three hours every morning. The graduate in charge will have, or should have, at her finger-tips the psychological knowledge to treat the so-called difficult child, or the child who clings too much to mummy, the excitable child, the nervous one, the anti-social boy, &c. One of the main things inculcated being warm love of parents and home, no emotional separation of child and home takes place—quite the reverse. And the mother gets a rest.

### In the Country Town.

In the case of the child in a small country town, there is often no graduate practising there, and the available children may be considered undesirable. In this case, social development being most important for your child, I should advise your having these children in to play, but staying yourself near the group—quite unostentatiously, of course. Soon you will find lovable points in those other children, and if you are wise enough to play just a little with them, or tell them a story, or have some nursery rhymes, how they will love you. You may need to correct mistakes in your child's speech, as one result of this companionship, but perfect English is not maintained under normal circumstances anywhere while children are young and imitative; mistakes in grammar, even "swearing" appear for short intervals in all well-conducted homes and schools; children love to imitate anything new.

### In the Bush.

For the parents of a solitary child in the far bush, there is one main solution of the problem—the mother or guardian must give up much time, at the cost of some other duties, to give the child companionship. But the companionship must aim at strengthening, not weakening, the child. Let all games, all "jobs," all enjoyments keep as near a fifty-fifty basis as possible. Train the child to be a "good loser." Develop responsibility by letting him keep pets and have entire control of their welfare. For mental culture, good books with clear pictures are essential, but see that he does not get too many stories or he will become a dreamer, and, later, will find normal life hard. Handwork, be it connected with small house duties, carpentry, drawing, or other activities, is useful in helping to keep the only child practical. Aim always at turning his thoughts outwards, away from himself. Any creative work should be steadily encouraged; finishing things started is an important part of efficiency, so guide him to start only things simple enough to finish. A pair of parallel bars for gymnastics has often helped an only child to get physical fitness; he needs muscular strength and the power of self-defence developed. Above all, if the parents co-operate and "pull together," then wherever the only child may be living he has the greatest help of all—the unified harmonious home.

## PORK RECIPES.

### Pork Chops Grande.

Allow one pork chop for each person, fry in the usual way and, while frying, prepare two onions peeled and sliced, two sticks of celery finely sliced. Fry in one dessertspoonful of butter. When cooked add two well-beaten eggs and half a cupful of milk. Stir for a few seconds. Place the chops, well drained, on a hot dish and pour savoury around. Serve with mashed potatoes or rice.

### Pork Pie.

Take 1 lb. minced pork, 1 pig's foot (for jelly), and prepare as follows:—Take 1 lb. self-raising flour, melt ½ lb. lard, pour over flour and work into a dough. Line a cake tin, fill with minced pork, and cover with remaining dough. Bake in moderate oven for one hour. Cover pig's foot with water, bring to boil, and allow to simmer for one and a-half hours. Strain and season to taste. Allow stock and pie to cool a little, then pour pig's foot stock into the pie and allow to cool and set.

This is a very nice dish and is readily prepared. If available, two pig's feet may be used instead of one to provide for a richer stock and jelly.

# Orchard Notes for May.

## THE COASTAL DISTRICTS.

IN these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become speckled or blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally as important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ inches in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of specky or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one-sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month; and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now, as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

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## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

CLEAN up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place as, if delayed till the pruning has been finished, the land is apt to dry out.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines*, as the later vines are pruned in the season the better in the Granite Belt district, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manure—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland; and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled, they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and, when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

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# Farm Notes for May.

FIELD.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late-maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

The necessity of pickling all wheat intended for sowing purposes is again emphasised; and for general purposes, combined with economy in cost of material, the bluestone and lime solution holds its own. To those who desire an easier but somewhat more costly method of treatment, carbonate of copper at the rate of 1 oz. to the bushel and used in a dry form is suggested.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

PLATE 39.—WATERFORD SHIRE.—BRISBANE–MOUNT LINDESAY ROAD.
Jerry's Downfall Section—showing a cement penetration floodway.
[*Photo.: Main Roads Commission.*

## CLIMATOLOGICAL TABLE—FEBRUARY, 1933.

Compiled from Telegraphic Reports.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. Means. Max. | Means. Min. | Extremes. Max. | Date. | Min. | Date. | Rainfall. Total. | Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| *Coastal.* | | | | | | | | | |
| Cooktown .. .. | 29·79 | 88 | 74 | 95 | 21 | 72 | 3, 5, 6, 8, 9, 16 | 2,860 | 18 |
| Herberton .. .. | .. | 79 | 65 | 86 | 26 | 61 | 25, 26 | 1,327 | 20 |
| Rockhampton .. .. | 29·85 | 89 | 73 | 96 | 21 | 68 | 4, 5 | 167 | 6 |
| Brisbane .. .. | 29·89 | 86 | 67 | 98 | 13 | 60 | 23 | 244 | 4 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. | 29·87 | 89 | 63 | 102 | 14 | 48 | 22 | 296 | 5 |
| Stanthorpe .. .. | .. | 82 | 56 | 96 | 14 | 42 | 22, 23 | 140 | 4 |
| Toowoomba .. .. | .. | 83 | 59 | 97 | 14 | 46 | 22 | 258 | 4 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·75 | 88 | 72 | 97 | 26 | 68 | 9 | 549 | 18 |
| Longreach .. .. | 29·78 | 95 | 70 | 105 | 25 | 63 | 8 | 163 | 5 |
| Mitchell .. .. | 29·84 | 93 | 65 | 103 | 24, 13 | 48 | 22 | 152 | 2 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 29·75 | 87 | 76 | 99 | 26 | 70 | 4, 7, 8 | 843 | 14 |
| Boulia .. .. | 29·77 | 95 | 70 | 104 | 10, 25, 26, 28 | 64 | 22 | 496 | 6 |
| Thargomindah .. .. | 29·82 | 96 | 72 | 110 | 12 | 63 | 21 | 7 | 1 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of February, in the Agricultural Districts, together with Total Rainfall during February, 1933 and 1932, for Comparison.

| Divisions and Stations. | Average Rainfall. Feb. | No. of Years' Records. | Total Rainfall. Feb., 1933. | Feb., 1932. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 10·08 | 32 | 19·22 | 6·21 |
| Cairns .. .. | 15·24 | 51 | 32·75 | 3·68 |
| Cardwell .. .. | 16·77 | 61 | 17·74 | 1·51 |
| Cooktown .. .. | 13·37 | 57 | 28·60 | 5·63 |
| Herberton .. .. | 7·62 | 47 | 13·27 | 3·11 |
| Ingham .. .. | 15·97 | 41 | 18·17 | 3·50 |
| Innisfail .. .. | 21·99 | 52 | 41·68 | 4·36 |
| Mossman Mill .. | 17·01 | 20 | 26·46 | 5·12 |
| Townsville .. .. | 11·12 | 62 | 10·03 | 2·19 |
| *Central Coast.* | | | | |
| Ayr .. .. | 8·88 | 46 | 7·89 | 2·80 |
| Bowen .. .. | 8·64 | 62 | 9·67 | 1·11 |
| Charters Towers .. | 4·36 | 51 | 6·34 | 0·15 |
| Mackay .. .. | 11·25 | 62 | 19·86 | 2·94 |
| Proserpine .. .. | 11·90 | 30 | 12·68 | 3·90 |
| St. Lawrence .. | 7·88 | 62 | 1·86 | 4·28 |
| *South Coast.* | | | | |
| Biggenden .. .. | 4·40 | 34 | 1·95 | 1·91 |
| Bundaberg .. .. | 6·43 | 50 | 4·90 | 0·61 |
| Brisbane .. .. | 6·30 | 82 | 2·44 | 0·70 |
| Caboolture .. .. | 7·83 | 46 | 3·62 | 1·50 |
| Childers .. .. | 6·61 | 38 | 4·15 | 0·96 |
| Crohamhurst .. | 13·17 | 40 | 4·08 | 3·33 |
| Esk .. .. | 5·55 | 46 | 3·93 | 2·49 |
| Gayndah .. .. | 4·25 | 62 | 1·71 | 0·52 |
| Gympie .. .. | 6·71 | 63 | 3·35 | 3·27 |
| Kilkivan .. .. | 4·94 | 54 | 1·39 | 1·15 |
| Maryborough .. | 6·61 | 61 | 5·38 | 1·35 |

| Divisions and Stations. | Average Rainfall. Feb. | No. of Years' Records. | Total Rainfall. Feb., 1933. | Feb., 1932. |
|---|---|---|---|---|
| *South Coast—continued—* | In. | | In. | In. |
| Nambour .. .. | 9·73 | 37 | 4·65 | 5·25 |
| Nanango .. .. | 4·15 | 51 | 2·44 | 1·25 |
| Rockhampton .. | 7·78 | 62 | 1·67 | 1·33 |
| Woodford .. .. | 8·60 | 46 | 3·70 | 2·15 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 2·86 | 63 | 2·96 | 0·60 |
| Emu Vale .. .. | 2·58 | 37 | 1·52 | 2·40 |
| Jimbour .. .. | 2·64 | 45 | 2·59 | 0·35 |
| Miles .. .. | 2·73 | 48 | 1·88 | 0·26 |
| Stanthorpe .. | 3·24 | 60 | 1·40 | 1·05 |
| Toowoomba .. | 4·53 | 61 | 2·58 | 1·29 |
| Warwick .. .. | 3·10 | 68 | 2·02 | 0·92 |
| *Maranoa.* | | | | |
| Roma .. .. | 2·07 | 59 | 0·98 | 0·11 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 2·22 | 19 | 0·83 | 0·12 |
| Gatton College .. | 3·46 | 34 | 2·89 | 1·11 |
| Gindie .. .. | 2·79 | 34 | 0·53 | 0·50 |
| Hermitage .. | 2·52 | 27 | .. | 0·80 |
| Kairi .. .. | 9·35 | 19 | .. | 3·56 |
| Mackay Sugar Experiment Station | 10·10 | 36 | 20·92 | 2·00 |

GEORGE E. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

### AT WARWICK.

| | April, 1933. | | May, 1933. | | MOONRISE. Apr., 1933. | MOONRISE. May, 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | a.m. | a.m. |
| 1 | 6·5 | 5·47 | 6·22 | 5·17 | 11·19 | 11·40 |
| | | | | | p.m. | p.m. |
| 2 | 6·6 | 5·46 | 6·22 | 5·16 | 12·13 | 12·24 |
| 3 | 6·6 | 5·45 | 6·23 | 5·15 | 12·59 | 1·1 |
| 4 | 6·7 | 5·43 | 6·23 | 5·15 | 1·47 | 1·33 |
| 5 | 6·7 | 5·42 | 6·24 | 5·14 | 2·27 | 2·5 |
| 6 | 6·8 | 5·41 | 6·24 | 5·14 | 3·4 | 2·37 |
| 7 | 6·8 | 5·40 | 6·25 | 5·13 | 3·37 | 3·8 |
| 8 | 6·9 | 5·39 | 6·25 | 5·12 | 4·8 | 3·45 |
| 9 | 6·9 | 5·38 | 6·26 | 5·11 | 4·41 | 4·24 |
| 10 | 6·10 | 5·37 | 6·26 | 5·11 | 5·16 | 5·11 |
| 11 | 6·10 | 5·36 | 6·27 | 5·10 | 5·52 | 6·10 |
| 12 | 6·11 | 5·34 | 6·27 | 5·10 | 6·33 | 7·14 |
| 13 | 6·12 | 5·33 | 6·28 | 5·9 | 7·24 | 8·22 |
| 14 | 6·12 | 5·32 | 6·28 | 5·9 | 8·26 | 9·30 |
| 15 | 6·13 | 5·31 | 6·29 | 5·8 | 9·30 | 10·37 |
| 16 | 6·14 | 5·30 | 6·29 | 5·7 | 10·35 | 11·41 |
| 17 | 6·14 | 5·29 | 6·30 | 5·7 | 11·39 | .. |
| | | | | | | a.m. |
| 18 | 6·15 | 5·28 | 6·31 | 5·6 | .. | 12·40 |
| | | | | | a.m. | |
| 19 | 6·15 | 5·27 | 6·31 | 5·6 | 12·45 | 1·36 |
| 20 | 6·16 | 5·27 | 6·32 | 5·5 | 1·46 | 2·30 |
| 21 | 6·17 | 5·26 | 6·32 | 5·5 | 2·43 | 3·26 |
| 22 | 6·18 | 5·25 | 6·33 | 5·5 | 3·39 | 4·19 |
| 23 | 6·18 | 5·23 | 6·33 | 5·4 | 4·34 | 5·16 |
| 24 | 6·19 | 5·23 | 6·34 | 5·4 | 5·29 | 6·11 |
| 25 | 6·19 | 5·22 | 6·34 | 5·3 | 6·23 | 7·5 |
| 26 | 6·20 | 5·21 | 6·35 | 5·3 | 7·21 | 7·59 |
| 27 | 6·20 | 5·21 | 6·35 | 5·2 | 8·17 | 8·49 |
| 28 | 6·21 | 5·20 | 6·36 | 5·2 | 9·10 | 9·37 |
| 29 | 6·21 | 5·19 | 6·36 | 5·2 | 10·3 | 10·21 |
| 30 | 6·22 | 5·18 | 6·37 | 5·1 | 10·54 | 11·1 |
| 31 | .. | .. | 6·37 | 5·1 | .. | 11·33 |

## Phases of the Moon, Occultations, &c.

| | | | |
|---|---|---|---|
| 3 Apr. | ☾ First Quarter | 3 | 56 p.m. |
| 10 ,, | ○ Full Moon | 11 | 38 p.m. |
| 17 ,, | ☽ Last Quarter | 2 | 17 a.m. |
| 25 ,, | ● New Moon | 4 | 38 p.m. |

Perigee, 12th April at 9.12 p.m.
Apogee, 28th April at 2.0 p.m.

A daylight spectacle of Mars and the Moon may be obtained on the 7th about 1 p.m., when Mars will be 3 degrees from the Moon, northward; they will then be in the west-north-west. On the next day, about 2 p.m., Jupiter may be seen somewhat nearer to the Moon, which will then be rather brighter.

Observers may have noticed that Mars and Jupiter have been apparently moving westward—Jupiter since 17th January; Mars since 24th January. Mars will be stationary on 13th April, and resume direct motion on 16th April, and Jupiter on 19th May, the two planets apparently meeting on 4th June.

Uranus will be on the far side of its orbit, in a line with the Sun, and at its greatest distance from the Earth—1,874,834,000 miles—on the 13th.

Venus is also drawing very near to the Sun, with which it will be in superior conjunction on the 21st.

On the 20th Mercury will be at its greatest western elongation, 27 degrees west of the Sun, apparently amongst the small stars of Pisces, 3 degrees eastward of the first point of Aries.

On the 25th Venus and the Moon will be in conjunction, or, rather, a distance of 6 degrees will separate them, about midday, but the Moon being new, they will be entirely lost in the Sun's rays.

The path of the Moon during the month will be:—In Taurus on the 1st, in Gemini 2nd and 3rd, in Cancer 4th and 5th, in Leo 6th, 7th, and 8th, in Virgo 9th, 10th, and 11th, in Libra 12th, in Scorpio 13th, in Orphincus 14th, in Sagittarius 15th and 16th, in Capricornus 17th, 18th, and 19th, in Aquarius 20th, in Pisces 21st, 22nd, 23rd, and 24th, in Aries 25th, again in Taurus 26th, 27th, 28th, and 29th, and in Gemini on the 30th.

Mercury rises at 4.57 a.m. on the 1st, and at 4.9 a.m. on the 15th.

Venus rises at 5.41 a.m. (24 min. before the Sun) on the 1st, and at 6.3 a.m. (8 min. before the Sun) on the 15th.

Mars rises at 4.5 p.m. and sets at 3.8 a.m. on the 1st; on the 15th it rises at 3.5 p.m., and sets at 2.11 a.m.

Jupiter rises at 4.40 p.m. and sets at 4.10 a.m. on the 1st; on the 15th it rises at 3.40 p.m. and sets at 3.10 a.m.

| | | | |
|---|---|---|---|
| 3 May | ☾ First Quarter | 8 | 39 a.m. |
| 10 ,, | ○ Full Moon | 8 | 4 a.m. |
| 16 ,, | ☽ Last Quarter | 10 | 50 p.m. |
| 24 ,, | ● New Moon | 8 | 7 p.m. |

Perigee, 11th May, at 3.42 a.m.
Apogee, 25th May, at 9.12 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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# QUEENSLAND AGRICULTURAL JOURNAL

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# Event and Comment.

## Anzac.

GALLIPOLI was a test of manhood and nationhood, and it found a young army of Australians and New Zealanders worthy of the best traditions of the British people. "The desperate feat was expected and then done. . . . No such body of free men has given so heroically since the world began." So wrote John Masefield, the Poet Laureate of Britain, recently, and his words were in eulogy of the men of Anzac. On 25th April Anzac Day was commemorated reverently, fitly, and amply in every centre of population in this vast continent, and in that observance was seen the vital element that keeps Australia true to itself, true to its heroic manhood, and true to the greatest traditions of the race from which we sprung.

## The Passing of Hinkler.

QUEENSLAND, in common with the rest of Australia, mourns the death of Squadron-Leader Herbert Hinkler, who met with disaster on a flight from Britain to Australia, and whose body was found late in April alongside his wrecked plane on a lonely storm-swept spur of the Apennines, in Italy. Hinkler was one of the distinguished company of Australian aviators whose service to science through their skill, enterprise, and intrepidity has received world-wide acknowledgment, and whose achievements fill many illuminated pages in the annals of air conquest. Of that company, without detracting from the accomplishments of others of the gallant band who conquered time and circumstance in wonderful flights from England to their homeland, Hinkler was in many ways pre-eminent. Since he flew from London to Darwin in sixteen days his time has been improved upon by other riders of the sky, but to him belongs the honour and indelible record of achieving a solo flight in a light aeroplane from Britain to the Antipodes that but a year or so before had been regarded as a physical impossibility. He brought honour not only to himself, but to the Commonwealth, his native State, and his birthplace—Bundaberg. Other great trans-ocean flights he had made since, but none captured popular imagination more than his first epoch-making adventure. Australia mourns the loss of one of the most distinguished of her sons, and, may be, the youth of this young land will continue, while the nation exists, to draw inspiration from the memory of the man himself and the deeds that made his name imperishable.

## Tobacco-growing in the North.

ON his return from a visit to the Far North during March, and in the course of which he inspected all the tobacco settlements from Ayr to Cooktown, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, expressed the opinion that the tobacco-growing industry in Queensland has now passed through the pioneering stage, and is in the commercial phase, but needs nursing. There were, he said, four tobacco growers in the Cooktown district, two of whom had taken up land in the vicinity of Laura, while two pioneers were growing tobacco at a point 30 miles north of Cooktown. In this area tobacco was purely in the experimental stage, and he had arranged that an officer of the department should visit the locality to help the producers during the curing process. The second, or commerical, stage of the industry had been reached, and it was apparent that the industry must be carefully nursed and fostered if it was to assume a permanent position in the agricultural activities of the State. The tobacco crops were very variable, ranging from excellent to indifferent. All the growers appeared to be facing the technical side with courage.

## Our Export Trade—Economic Danger

RECENT events indicated that Australia was in grave danger of becoming an economic outcast rather than a member of an economic federation, said the Minister for Agriculture and Stock (Mr. Frank W. Bulcock), in the course of comment on recent British trade treaties.

The Minister said that the agreement which had recently been entered into between Britain and Argentine in respect to beef, the agreement made with Denmark in regard to butter, and the further proposed agreement with Sweden were of very great interest to primary producers in Australia generally, more particularly to the meat producers and dairy farmers of Queensland. A review of recent agricultural happenings certainly indicated that the Commonwealth by legislation and administration had attacked the Queensland primary industries, while the Imperial authorities attacked Commonwealth primary industries. Some very significant features appeared to be associated with the new Argentine beef agreement. For instance, if a reduction of the quota became necessary Australia was not to benefit by that reduction; or, in other words, Australia—and this principally meant Queensland in this connection—was placed in a position from which it would be impossible to emerge so long as the agreement was in operation. This meant, in effect, that the present relative statutory quotas would operate for three years.

Producers in Australia would, no doubt, derive but meagre consolation from the fact that certain matters might be submitted to tribunals. Judging by recent experience, tribunals of this description were apparently more prone to consolidate the position from an Imperial point of view than to help Australia to overcome her difficulties.

It was significant, said Mr. Bulcock, that it was reported that meat under the Argentine agreement was promised fair and equitable treatment, but Australia's claims to fair and equitable treatment were not mentioned. A review of the whole agreement very clearly indicated that it was based on the desire of the Imperial authorities to secure payment of the public debt due to Britain by the Argentine. This opened up the very interesting question of the necessity for adjustment so far as the Commonwealth was concerned for such treatment as would allow Australia to discharge her obligations to Britain.

The butter agreement, added Mr. Bulcock, was even more interesting. It would be noticed that it did not restrict Danish butter, and Denmark was guaranteed a market for 115,000 tons of butter annually. While Australia was being asked to agree to a restriction of butter exports to Britain, a treaty was apparently being negotiated that did not provide for any restriction from this foreign source. They were informed that a trade treaty was in course of preparation with Sweden and that other primary commodities were the subject-matter of negotiation.

The whole policy seemed to indicate that if it be persisted in Australia was in grave danger of becoming an economic outcast rather than a member of an economic federation. As debts were paid in goods, every restriction that was placed on Australia's commodities on the Imperial market gravely aggravated the difficulties, and must eventually lead to a realisation by Australia that if she could not sell her goods she could not meet her obligations. They were told from time to time that they must increase production, but the limitation of production was brought about on every occasion when other countries were given additional access to English markets. Conservative opinion appeared to be adverse to the agreement, and suggested a protest against the sacrificing of the home and dominion markets.

## The Java Wonder Cane—Warning to Growers.

DISAPPOINTMENT has attended the efforts to establish P.O.J. 2878, the "Java wonder cane" in the North, mainly on account of its susceptibility to disease, and the Bureau of Sugar Experiment Stations has found it necessary to warn growers against planting it extensively—for the present, anyhow. It is a pity, for much was expected of this cane as an influence on the economics of cane production in Queensland.

This variety was bred at East Java about ten years ago, and quickly gained a reputation for yield and other qualities that gave it a decided advantage over all other standard varieties in the country of its origin. Under a wide range of soil, environment, and seasonal conditions, its consistent superiority was maintained, and in the course of five years 95 per cent. of the cane lands of Java were planted with it. The influence, by the way, of this cane on Javan crop returns is an excellent illustration of what can be done in the breeding of new varieties by sustained effort along carefully planned lines.

Three sets of this cane were brought to Queensland in 1928, and propagation proceeded as rapidly as possible with a view to finding out its value under Queensland conditions. It aroused high hopes, especially after it had made a promising start in some districts. The discovery has been made, however, that it is seriously susceptible to disease. This is unfortunate, for the cane gives, in general, a quick strike and a good stool, besides being a good ratooner. Though rather slow of growth in its early stages, it later develops at a rapid rate, and under favourable conditions high tonnages have been recorded on trial plots. The variety is, however, a late maturer, and this is a serious matter in areas where a succession of dry months in the winter and early spring may result in a collapse of the crop before it has attained maturity. Such conditions have been experienced in the Mackay district with a related cane—P.O.J. 2714. As regards c.c.s. content, the variety is inferior to our better-class canes.

It is from the point of view of disease susceptibility that the "wonder" cane is particularly disappointing. In areas were downy mildew is prevalent, practically all the propagation plots have been condemned on account of disease. In the pathologist's opinion, P.O.J. 2878 and 2714 are the varieties most susceptible to this disease at present in Queensland. When it is remembered that further plantings of this cane in proximity to B. 208 will probably intensify the proportion of disease in the latter cane, it is felt that it would be suicidal to jeopardise the value of this early-maturing cane for one whose worth has not been established and which cannot be expected to show superiority under local conditions.

In the far northern areas, where top rot disease makes its appearance under favourable climatic conditions, P.O.J. 2878 is certain to suffer considerable damage. With this disease the variety has proven to be one of the most susceptible known, and heavy losses may be expected with spring plant cane or late ratoons. Under these conditions April planting is practically essential if serious damage is to be averted, should later conditions prove favourable to the development of the disease.

Fiji disease is also sure to take a heavy toll of this cane in areas where the malady is present. In parts of the Fiji Islands where the disease occurs the variety has been practically wiped out.

As regards pokkah boeng, the "wonder" cane exhibits the same susceptibility as its kindred cane—P.O.J. 2714. Although this disease is of minor importance with most of our standard varieties, it is liable to become serious with this cane. The entry of fungus diseases through "knife cuts" in the stem, often caused by pokkah beong, results in the development of rots which seriously reduce the sugar content of the cane at harvest time.

It is only in the case of Mosaic and, particularly, gumming disease control, that P.O.J. 2878 is a very useful variety, for in all the resistance trials conducted to date it stands at the head of the list of canes highly resistant to gumming. It is for this reason that an attempt is being made to propagate rapidly the variety in the southern sugar areas, and results to date are very encouraging. This year yield trials on a fairly extensive scale should give a definite indication of its superiority or otherwise. Of course, its success could not be regarded as a solution of the gumming-disease problem; the shortcomings of the variety in respect to its lateness of maturity is a serious handicap, and it is absolutely essential that a resistant early maturer be found of satisfactory yielding capacity before it can be said that the disease is effectively under control.

From what has been said about it, the conclusion must be that the new cane does not measure up to the earlier anticipations of its merit. The cane is worth a thorough trial, and, except in the areas where the diseases mentioned are prevalent, plantings on a modest scale will be made this year. As the result of further observations, it is hoped that sufficient specific data will be available to warrant a definite statement as to its suitability or otherwise over the wide range of canegrowing conditions in Queensland.

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

### FINAL DESTRUCTION OF CANE STOOLS BY FULLY MATURED GRUBS.

By EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

### GRUBS COMMENCE TUNNELLING DOWNWARDS TO CONSTRUCT PUPAL CELLS.

DURING the earlier weeks of this month greyback grubs can still be found under stools which they have totally destroyed, busily engaged in devouring the underground basal portions of any remaining sticks, while should the crop be plant-cane the sets also are usually attacked and more or less hollowed out (see illustration). Towards the end of May the full extent of the damage wrought in our canefields by this cane beetle becomes apparent. The percentage of such injury is generally greatest on deep soils of a light, friable character, such as occur, for instance, at the Greenhill Estate near Hambledon, where the ground happens to be of volcanic origin, or on much of the so-called high lands met with in the Cairns and Babinda districts.

With regard to the economic status of this pest, it may be mentioned here that, unlike several closely related beetles occurring in other countries the grubs of which inflict maximum damage to roots of cane and other plants at intervals of from two to three years apart, the complete life-cycle of the Queensland cockchafer (from laying of the eggs to appearance of adult beetles) occupies a period of only twelve months; so that we are compelled to combat the ravages of its grubs every year.

It is probably to this fact, coupled with the large size, voracity, and long continuance of the grub condition, that we must attribute those capabilities for destruction which during seasons of normal rainfall have enabled this insect to obtain first place amongst our pests of sugar-cane. Being, moreover, an indigenous species, it naturally proves very difficult to cope with, seeing that much of our acreage under such crop is more or less surrounded by virgin scrub or forest country, comprising enormous tracts of land over which this native insect continues to breed and multiply as of old, and from which it may extend its range of flight to adjoining cultivated areas.

Cane grub damage is in evidence during a period of three months—from March to May—the greatest injury being effected about the end of the former month, and continuing practically throughout April and May.

#### Attitude of Canegrowers Towards Fumigation.

On selections where only one or two blocks happen to be lightly grub-infested many farmers prefer to chance results, rather than incur the expense of fumigating their land.

In such cases the element of chance proves more or less attractive, especially on farms where certain fields of early-planted cane are nearing maturity, and there appears a possibility of obtaining sufficient rain to enable the stools to replace any roots being eaten, and of maintaining an upright position until commencement of the crushing season.

In cases of heavy infestation (an average of ten or more grubs per stool) the future of such crops should never be left to chance, and remedial treatment then becomes imperative. One hears much talk about the cost of fumigants and their being too expensive for use against cane grubs. Such erroneous opinions, however, generally come from those who have not given them a trial; those who have done so being, on the contrary, enthusiastic in praise of this form of grub control. Certainly, a grower who happens to suffer losses each season cannot afford to disregard the merits of soil fumigation. Let us suppose, for instance, that he has

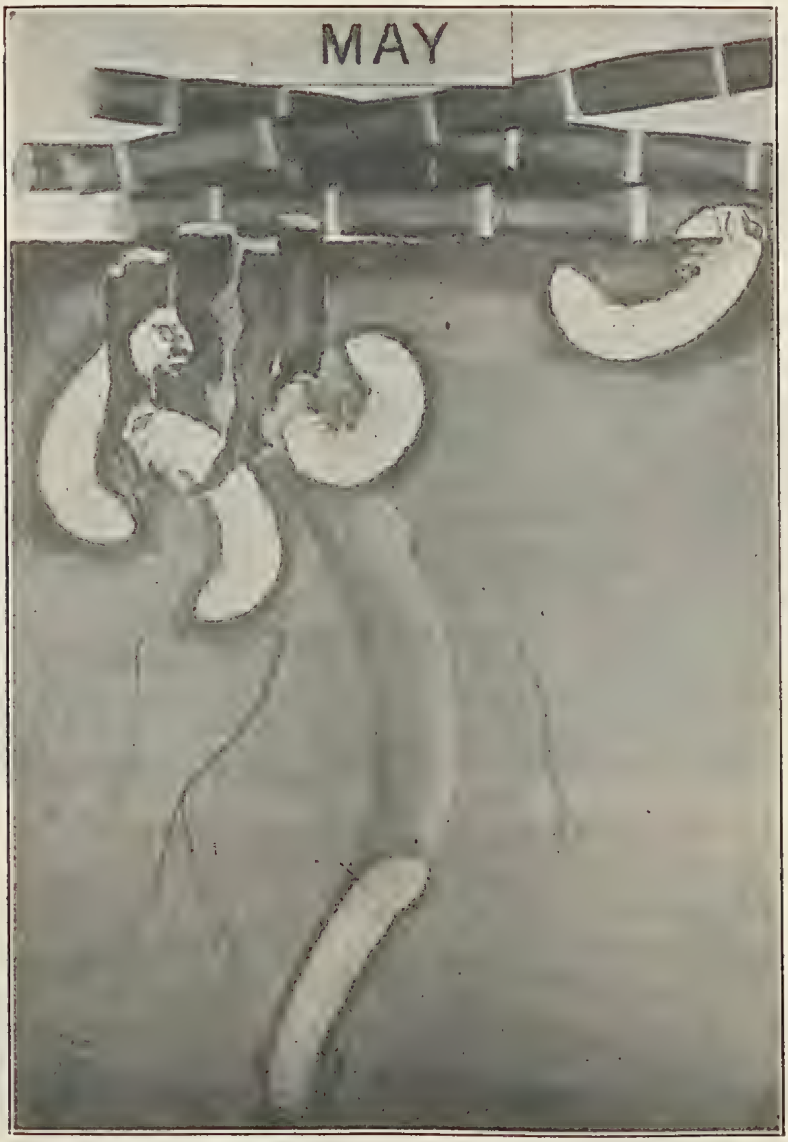


Plate 40.—Cane Sticks eaten out of the ground by Grubs of the Greyback Cockchafer. A fully matured grub is seen tunnelling downwards to construct its pupal cell.

a crop estimated to yield 25 tons per acre. Would he not be wise to sacrifice five of them in order to make sure of harvesting 20 tons? The 5 tons would pay for the expense of fumigating the acre in question, and not only ensure him a return of 20 tons of cane, but also a crop of ratoons for the following season. On the other hand, by neglecting to fumigate he runs a risk of losing the entire 25 tons and incurring the additional expense of replanting the acre, to say nothing of the cost of cane sets for planting this acre twice over, and the loss of much valuable time.

### Tenacity of Life in Cane Grubs.

During our wet season the cane on low-lying river flats is sometimes completely submerged. In the event of such crops remaining covered for a couple of days, 75 per cent. or more of the grubs present would succumb to the immersion. In this connection it will be of interest to mention the following experiment:—Full-sized grubs were placed singly in glass test tubes containing rain water, in which, after struggling a few seconds, they sank to the bottom. About an hour later all motion had ceased, and they lay in doubled-up position with legs widely extended. Grubs taken out of the water after intervals of five and a-half, twenty-six, and thirty-two hours' submergence ultimately recovered, while those subjected to forty hours' immersion did not revive.

In repeating this experiment grubs were found to recover from a submergence of forty-one hours; but others, although regaining slight movement after forty-seven hours under water, did not live more than three days. Again, others subjected to sixty-six hours' immersion continued motionless for a time, and then started to decompose.

PLATE 41.—View of Portion of Cane Crop devastated by Grubs of the Greyback Cane-beetle.

### Grubs Commence Pupating.

Towards the end of this month the fully-developed grub tunnels to a depth of from 18 to 24 inches, where it prepares a cavity in the subsoil to undergo its slow change to the winged adult or beetle. The period of pupation extends from July to September, reaching its completion towards the end of the latter month, by which time greybacks will have practically disappeared, and when digging or ploughing deeply one finds only pupæ of this beetle. These lie quietly in their smooth-walled cells in horizontal position, and if touched lightly will generally wriggle the abdominal portion of the body.

Details regarding the pupal state of our greyback cane beetle and its control will be described under the month of August.

**Common-sense Control of Grubs.**

Economic entomologists the world over have long realised the value of systematically collecting the various injurious species of root-eating grubs. In Porto Rico, for example, this method has proved very successful, and is considered to be one of the best ways of preventing such insect pests from increasing. Similarly, in cane-growing districts of Queensland it has yielded good results in the past and is still being followed up with advantage in various centres. The method usually adopted consists in picking up the grubs from behind ploughs and in collecting them from under trash or other debris whenever possible.

The plate for May shows a third-stage mature grub tunnelling downwards to pupate, while three others are engaged in devouring the basal remains of ruined cane sticks, and one is on the surface enjoying the juicy sweetness of a fallen cane.

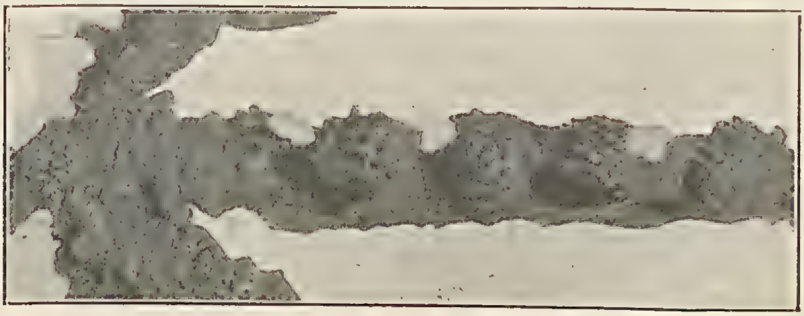

PLATE 42.—Portion of an old Cane Set, badly eaten into by Grubs of the Greyback Cockchafer. (About one-third natural size.)

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**TO SUBSCRIBERS—IMPORTANT.**

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

# The Control of Sugar Cane Diseases.

By ARTHUR F. BELL.*

THE ultimate aim of all plant pathological investigations is the reduction or elimination of the economic losses caused by the diseases under consideration. Naturally, a very great deal of the work carried out has no immediate economic value but must be undertaken in order to advance knowledge to the stage where experiments having a direct economic bearing may be devised on a sound basis. This is particularly the case in Australia; our most important diseases have hitherto had a restricted distribution, and consequently we have not had the benefit of researches conducted in older sugar lands. The object of this paper is to set out for your information examples of the broad principles upon which we are working, and to indicate certain points at which we require the co-operation and support of a body such as this Society.

Apart from legislative measures in the establishment of various types of quarantine, the control of sugar cane diseases may be divided into three main modes of attack, as follows:—

1. Prevention, or what we might term escaping a disease, by the careful selection of disease-free planting material;
2. Reduction, either wholly or in part, of losses due to disease by modification of agricultural practices;
3. The breeding or introduction of suitable cane varieties which are resistant to the diseases of the locality.

The last-named is purely a matter for the plant breeder and pathologist, but, after the necessary knowledge has been obtained and disseminated, the application of the first two methods must rest mainly upon the efforts of the cane producer.

Disease control in countries where the estate system obtains, such as in Hawaii, and control in countries where the small farm system is the rule, such as in Australia, are two vastly different propositions, and the relative importance of the methods outlined above varies accordingly. The former are, naturally, in a much better position to combat diseases and their work is greatly simplified. For example, the estates, with unified control and command of finance, can easily place the important factor of the selection and maintenance of supplies of disease-free planting material under the control of a specially trained technologist, and, of equal importance, can ensure that the conditions laid down by this man are fulfilled to the very letter. Again, we have a comparatively newly found disease in North Queensland, which, like Sereh disease in Java, appears to be readily controlled by hot water treatment of cuttings. In such treatments there must necessarily be rigid control of temperature, as a rise of 2 degrees would cause the death of cuttings, but it is a relatively simple matter for an estate to instal a plant to carry out the treatment effectively and expeditiously. On the other hand

* In a paper read in the course of proceedings of the Fourth Annual Conference of the Queensland Society of Sugar Cane Technologists, at Ayr (Q.), March, 1933.

it is manifestly impracticable for the farmer to instal such a plant, and, similarly, the farmer cannot be expected to be an expert in the many phases of scientific agriculture. We do not criticise him for this; in view of the multiplicity of his activities it must be accepted as inevitable. But it must be emphasised that these and many other disabilities now attendant upon the farm system may be overcome by co-operation, and we urge it as the duty of members of this Society to stress the necessity for co-operative effort in agriculture and to foster its development as much as lies in their power.

## PREVENTION.

The extent to which the practice of plant selection may be successfully employed will naturally depend upon the type of disease, the manner in which it is spread, and local conditions. In most parts of Queensland mosaic disease is very easily controlled by plant selection, but in a few restricted areas the rate of secondary spread is so rapid as to render this method useless, and recourse must be had to the use of highly resistant varieties.

The basic essential in the selection of disease-free planting material is the ability to recognise in the early stages any diseases which are likely to be encountered. Well illustrated pamphlets describing the symptoms of all the diseases found in Queensland have been published at various times and are re-published as occasion demands. Museum collections of preserved specimens have been established at various centres, officers of the Bureau disseminate information by lectures and visits to individual farmers, and as a later and important development a series of lectures on sugar cane diseases has been included in the curriculum of the sugar technology course of the Central Technical College.

When the symptoms are permanent and uniform, as in the case of mosaic and Fiji disease, it has proved quite easy to teach farmers to recognise these diseases, but it is unfortunate that many diseases, including our two most important, have symptoms which are frequently inconspicuous and transient, particularly in the early stages, and which vary a good deal in form throughout the life of the plant. In such cases it is almost impossible to obtain satisfactory diagnoses unless the observer has had special instruction and has been enabled to make first hand inspections of diseased plants in all stages.

While satisfactory plant selection may be made in the field in the presence of some diseases, the majority, owing to masking or inconspicuousness of early symptoms, require that plants shall be taken only from disease free fields. As an example of the latter type let us consider leaf-scald disease which may be found on practically every farm in the far North. Our investigations have proved that the symptoms of this disease may remain masked for quite long periods, so that a series of very thorough inspections is necessary before a field can be declared disease-free. Fortunately, we are also finding that *in the absence of knife infection* the rate of secondary spread of this disease is for the most part very slow and, provided a field is planted with healthy plants and harvested with sterilised knives, the cane will remain healthy for reasonably long periods. We have every reason to believe that this and similar diseases may be controlled in all but the most highly susceptible varieties by the use of disease-free plants from small well-tended farm nursery plots which are in turn periodically replanted from isolation nursery plots.

Economic pressure bears yearly more heavily upon the cane sugar producer and has every indication of continuing so to do. It is rapidly becoming imperative even in the most favourably situated districts, to obtain the absolute maximum crop yield for a given monetary outlay, but maximum yields cannot be obtained when diseased and inferior cane is used for planting. We therefore submit the following scheme as the simplest method of ensuring satisfactory supplies of suitable planting material, particularly in tropical Queensland. A central authority, such as the management of a co-operative mill, should engage and equip a qualified man capable of conducting a disease control campaign. Under his supervision the central authority should purchase or lease a small area of land in an isolated position and cultivate up to about 10 acres of suitable cane. This small area could be inspected frequently and thoroughly cultivated in accordance with the best agricultural practice, and irrigated if necessary. Under the direction of the controlling officer the cane would be harvested and distributed to farmers for planting in farm nursery plots which would in turn supply the cane for commercial field plantings. These plots should be established on the farm as far from other cane as possible; they would not require to be more than an acre in extent, and so could be given the best care and attention, and precautions taken against accidental infection. As the chief precaution special knives would require to be kept for the harvesting of the nursery plot cane and cutting it into plants, these knives being sterilised periodically in boiling water or disinfectant.

The central isolated nursery plot should be practically self-supporting, and the expenses of the officer for the time spent in disease control would be small, since he could also be engaged upon pest control, agricultural experimentation, and other important and productive work. The direct expense to the average farmer through the purchase of plants might be as much as £1 per annum.

## MODIFICATION OF AGRICULTURAL PRACTICE.

It is more or less a truism that any practice which will improve the vigour and vitality of the plant will also reduce the virulence of the disease, and in that respect improved agricultural conditions are a desirable aid in the control of any disease. At this juncture, however, we will consider only those diseases which are profoundly affected by modifications of cultural practice.

It is characteristic of the living organism that it lies heir to many ills of senility, and sugar cane is no exception. The obvious treatment for such diseases, then, is to harvest the cane before the advent of this period of senility, or, in other words, harvest the cane before it passes beyond the point of maturity. Red rot and the sour rot of the Burdekin district may be considered as typical diseases of senility. Red rot is one of the most widely distributed of sugar cane diseases, and the causal fungus may be found with the greatest ease in practically every Queensland canefield. Therefore, in so far as this disease is concerned, plant selection is of little avail; we have found experimentally that red rot diseased cuttings germinate poorly, but such plants as do result are not more liable to contract the disease than are plants from healthy cuttings. The source of infection is ever present, and awaits only the suitable condition of the cane before launching its attack. The disease is rarely seen in immature cane, but once the cane attains maturity and begins to lose vitality the tissues are rapidly invaded by the fungus, the peculiar reddish rot results, and the sucrose content falls with alarming rapidity.

The solution of the difficulty is intimately associated with modification of our existing methods to the extent of instituting a rational maturity testing campaign, which will enable the date of the commencement of crushing to be determined by the stage of maturity of the cane and ensure that the individual fields are harvested at the most favourable time. Bad outbreaks of red rot may be taken as a symbol that either there is an undue preponderance of early or mid-season maturing canes or that the crushing season did not commence as early as it should have done.

Some modification of the above statement is necessary in the case of a very late maturing variety in the presence of droughty conditions during the later part of the season. In this case the unfavourable conditions may bring about a premature loss of vitality before the cane can attain maturity, and red rot is almost certain to make its appearance.

At the other end of the scale we have diseases which are greatly influenced by the time of planting as, for example, mosaic and red stripe (top rot) diseases. Mosaic is a virus disease transmitted from diseased to healthy plants by an aphid (*Aphis maidis*) which is most abundant in late summer and autumn. The cane plant becomes progressively less susceptible to mosaic with advancing age and, consequently, the older the plants are at the height of the aphid infestation the better chance they have of escaping the disease. In several countries, therefore, we find that part of the mosaic disease control programme consists in autumn planting. Red stripe disease, which is also known as "top rot" and "Burdekin top rot," is commonly found in Badila in North Queensland, and has come somewhat into prominence during the past few years. As in the case of red rot the causal organism is very widely distributed, and attacks susceptible varieties immediately conditions are favourable. So far our investigations have been confined mainly to Badila, since this is the only important commercial variety concerned as yet. We have found that in this variety the disease may be very simply controlled by the adjustment of the time of planting (or ratooning). Badila planted in March-May and given a good start off will be found to escape the disease, while immediately adjacent cane planted in the following spring may suffer a mortality of upwards of 25 per cent. during the succeeding January-March. As an interesting example of the efficacy of this form of control I would refer you to an experiment conducted at South Johnstone last year:—Two rows of Badila, one planted in April and the second in August, were planted side by side in well-trenched ground, and as far as possible were grown under ideal conditions of moisture, drainage, and plant food supply. Throughout the period of growth no sign of top rot could be seen in the cane planted in April, whereas at the end of March death of stalks had occurred in the August plant cane to the extent of over 25 per cent. Some five or six years ago top rot in Badila was causing some concern in the Burdekin district, but in later years the amount has grown steadily less. This is no doubt due to the average earlier planting and the very considerable improvement in field practice which has taken place during the last five years.

Unfortunately, it is not always possible to practice autumn planting, or to harvest all the fields which are to be ratooned in early or mid-season, and we are faced with the problem of reducing the losses due to top rot in spring plant cane or late cut ratoons. At this point, however, it would be well to emphasise the fact that the losses from top rot are never as great as is popularly supposed, and a 10 per cent. death

of stalks must not for a moment be taken as representing a 10 per cent loss of crop. We have conducted experiments which demonstrate that the loss of one or more stalks in the stool is compensated by the increased vigour of the remaining stalks in the stool. If the greater part of the death occurs moderately early in the rainy season it is probable that the death of as much as 10 per cent. of the stalks will cause a negligible loss of crop.

Statistical inquiries have so far confirmed our earlier observations on late-planted fields, viz., that the greater the number of stalks per acre the greater the likelihood of death due to top rot. In fertilizer trials the increased tonnages in the treated plots have been found to be due in part to the greater stalk production per acre, and the amount of top rot is likewise found to be somewhat greater than in the control plots. The increased amount of top rot in the Johnstone district during the past five or six years is therefore possibly due to increased use of fertilizers in late-planted crops during that period. It would seem then that the desideratum is the improvement of tonnages of late plant or ratoon crop by an increase in the size of the individual cane stalks rather than by increasing the number of stalks per acre, and this is one aspect of the problem now being investigated.

Cleanliness of the fields may be a very important consideration for two reasons:—(1) Certain weeds may be alternative hosts of the disease, and so act as sources of infection, thus largely nullifying the advantages of having used healthy planting material; (2) a disease may be transmitted by an insect which only feeds on cane by accident and would not breed on cane but which thrives on various types of weed. Both these factors operate in the case of mosaic disease, and thus control is greatly aided by clean fields and clean headlands.

A number of the organisms responsible for diseases are weak parasites, that is to say they are incapable of attacking a plant in full vigour, but should the host plant receive a set-back by adverse conditions, they become established and thereafter take toll of the host. The root diseases found in Queensland are of this type. They must be considered primarily as indicative of the existence of unfavourable conditions, and in the absence of drought are controllable by improvements in planting material, fertilization, or cultural conditions.

## BREEDING OR INTRODUCTION OF RESISTANT VARIETIES.

In the absence of the estate system and in the absence of a co-operative and co-ordinated agricultural policy, the development of resistant varieties must constitute the chief mode of attack in the control of cane diseases in Queensland. This method has the advantages of being permanent, automatic in operation, and imposing no direct expense—in short, something for nothing—and thus in full accord with the commonly held view that disease control is something that should entail neither time, labour, thought, nor expense. The disadvantages lie in the fact that the original search for resistant varieties is often a slow, tedious business, and many excellent varieties of superior yielding power must be discarded through not quite attaining a fool-proof standard of resistance. Of course, circumstances may permit of no choice of methods, and in the Southern districts, where the rapidly transmissible gumming disease is so widely distributed, we must have recourse to highly resistant varieties at least until the situation has improved very considerably.

Up to the present our chief efforts have been directed towards finding varieties resistant to gumming disease, and a description of the methods used will serve to illustrate the principles as applied to other diseases. During the conduct of resistance trials it has been observed that the progeny of particular crosses could be readily classified according to the general standard of resistance exhibited. For example, it would be found that the progeny of the cross A x B contained a high proportion of resistant seedlings, while the majority of the seedlings from the cross C x D proved highly susceptible. Accordingly, our disease-resistance trials are now of two types:—

(*a*) About two stools, each of up to 100 selected seedlings represented each new cross to determine whether or not the particular cross has a reasonably good chance of yielding disease-resistant seedlings. If only a very low proportion of resistant seedlings are produced the cross is naturally discarded.

(*b*) Six to ten stools of seedlings which show commercial promise or varieties which have been imported from abroad.

The trials are carried out in a locality where conditions are favourable to the full development of the disease. Included in each trial are several varieties of graded resistance or susceptibility whose performance under field conditions is well known, and the resistance of the unknown varieties is then determined by reference to these known standards. Every second or third row in the plot is a guard row consisting of a mixed planting of susceptible varieties, so that every unknown variety is in contact with guard row cane of two or more varieties. When the cane is 2-3 feet high the plants in the guard rows are inoculated by means of needles dipped into a suspension of the gum. This susceptible cane soon develops the disease, and thereafter serves as a constant source of infection for the experimental varieties. Inspections are made periodically, and the progress of the disease in each variety is recorded and, at the conclusion of the trial, all doubtful canes are dissected and examined. The results obtained are clear cut and remarkably consistent, and in most cases there need be little hesitation in accepting the results of a single trial with any one variety. The effects on the cane vary to a remarkable degree, ranging all the way from the practical immunity of Uba to a consistent 95-100 per cent. death in the case of the seedling S.J.4.

In order to find varieties to combat gumming disease, about 80 selected varieties were imported from Hawaii, India, and Java in 1928-9, and after growing in quarantine for a year were planted in resistance trials in 1929 and 1930, together with fifty to sixty varieties which were already in the country. As a result of such trials we have found some fifteen varieties of sufficiently high resistance to be grown in the presence of gumming disease with impunity. Some of these are now in a yield trial, and the remainder are being propagated for inclusion in yield trials as soon as possible. Some of these canes show considerable promise, and it is confidently expected that they will be the means of eliminating all losses due to gumming disease in Southern Queensland.

Gumming disease lends itself to this type of investigation rather more than most diseases, but the principles are gradually being applied to other important diseases, of which leaf-scald is now receiving chief attention.

*Bureau of Sugar Experiment Stations,*
*Brisbane.*

# Hints to Beginners in Beekeeping.

By HENRY HACKER, F.E.S., Entomological Branch.

THE feeling that there is room for expansion in Queensland for beekeeping has been reflected by the numerous inquiries addressed to the Department of Agriculture and Stock during the last year. Many of these letters were received from persons without any previous experience with bees, and it is to this class that the following remarks are chiefly directed.

Although apiculture is extremely fascinating to most people who have a taste for the study of nature, the income to be derived from it is generally the chief factor in leading one to undertake the care of bees. Where large apiaries are planned, they require much hard labour and great watchfulness; the performance of the work at stated times is imperative, and the beekeeper has few opportunities of making a leisurely study of their natural history and habits, his time being almost wholly taken up in attending to the most apparent wants of his charges.

### Returns to be Expected.

Many people ask for information regarding the profit to be derived from beekeeping, but it is very difficult to answer this question except in a general way. Even the best situations, like all others, are subject to reverses—the result of drought or excessive wet. Under these adverse conditions the beginner must bear in mind that much experience is necessary to enable him to turn to the best account seasons below the average, while during periods of severe drought it will take considerable understanding of the subject, energetic action, and some sacrifice to tide over without disaster. On the whole, there should be expected from beekeeping only fair pay for one's time, good interest on the small capital invested, and a sufficient margin to cover contingencies.

### Where to Commence.

Any place where farming or fruit-raising can be successfully followed is suitable for the profitable keeping of bees, in a limited way at least. It is evident, therefore, that, if the bees are not to be the main source of income, the place where one happens to be situated is quite suitable, as the ability of the bees to draw their sustenance for 2 or 3 miles around must be taken into account in estimating the possibilities of a locality.

On the other hand, when bees are to be kept more extensively as a sole means of livelihood, one must be prepared to go into the "bush" as soon as the elementary knowledge and some experience in handling bees has been acquired. Queensland possesses a splendid honey-producing flora in her forests, of which enormous areas still remain unoccupied by the beekeeper.

Having decided on the district in which to commence, the prospective apiarist should examine as many places as possible within it, weighing the advantages or otherwise of each site before coming to a final decision. Probably the best sites are those consisting of good

mixed *Eucalyptus* forest situated a little inland from the coast. The greater the variety of trees the better, as most eucalypts flower well about one season in three, and only moderately during the other two.

The nectar-producing flora will be found to vary considerably in different districts, according to their soil, rainfall, and elevation. For instance, the Darling Downs, which is rather sparsely timbered, more than balances this deficiency by a rich ground flora, consisting of weeds and low herbage which flower profusely during the spring months. Later in the season there is usually a good honey flow from lucerne, which appears to produce more nectar after it has had one or two cuttings. Apiaries suitably situated in these districts will produce quantities of high-grade honey.

In the coastal belt the conditions are somewhat different. The chief nectar-producing trees are *Leptospermum, Melaleuca,* and other swamp shrubs in the spring, various mangroves and eucalypts during the summer months, and tea-tree during the autumn. The honey produced is darker in colour, and consequently realises a lower price, than the Downs honey. This disadvantage, however, is offset by a more certain crop, due to the greater rainfall, the longer nectar-gathering season, and the much milder winters which are experienced in the coastal districts.

In certain localised areas, such as river flats and creek banks, trees other than eucalypts often occur in sufficient numbers to make a honey flow. These are silky oak, bean-tree, and river myrtle, as well as other representatives of the genus *Eugenia,* all of which are good honey-producing trees. In other districts where prickly-pear still exists, it is considered to be a most useful plant.

Jungle or rain forest sites are not favoured as honey producers, chiefly owing to the lack of any outstanding nectar-producing tree. Moreover, the moist, shady conditions cause the bees to be backward in building up in the spring, for bees require warmth and sunshine to produce a satisfactory honey crop. When these areas have been cleared, however, and laid down in pasture, white clover is sometimes sown with the grasses. This plant grows vigorously in the virgin soil, whitening the paddocks with its flowers in early summer. Scotch thistles usually abound in such localities, growing from self-sown seed. If some of the land around is being cultivated with crops of maize, pumpkins, &c., these districts may be classed among the best for keeping bees.

In selecting a bee site, consideration should be given to the following two points:—Firstly, see that there is a permanent water supply within a short distance of the apiary. The quantity of water fifty to one hundred colonies will dispose of would surprise many people. Secondly, if the beginner intends keeping bees on a large scale, he should ascertain that no other bees are being kept within 4 miles of the selected site, as an otherwise suitable foraging ground may prove to be already occupied by a neighbouring beekeeper.

### How to Commence.

A beginning is usually made in one of the following ways, or by all of them combined:—

*Full Colonies of Bees.*—These may be purchased from established apiaries or bought up here and there until the desired number have been

obtained. They should be carefully examined before purchase, as there is some risk of getting neglected colonies containing old or poorly drawn-out combs. When a number of colonies have been acquired in this manner, it is advisable to purchase a full colony from a reputable queen breeder or bee-supply firm. It will be guaranteed high-grade Italian, and possess a tested queen. From this colony all the other colonies should later on be requeened, thus improving the strain of the entire apiary.

*Swarms.*—In the spring arrangements may sometimes be made for the purchase of swarms from beekeepers who do not wish to increase their number of colonies, or the beginner may see a swarm or two himself. Hives with frames of foundation should be bought and prepared beforehand. When a swarm has settled or clustered it should be hived in an ordinary box fitted with a lid, and, as soon as the bees are in, carried to the spot which the frame hive is to occupy. Towards evening when the bees are not likely to rise in the air again, the frame hive is placed in position, a bag or cloth spread out in front of the hive entrance in such a way as to provide an easy passage-way into the hive, and the swarm shaken or dumped out of the box on to the cloth. If the bees are slow in entering the frame hive, or if a considerable number remain outside, they may be gently driven in by blowing a little smoke on them; none, however, should be blown into the hive.

*Nuclei.*—Beekeeping may also be commenced in the spring by purchasing nucleus colonies. These consist of small hives holding three frames, and contain a queen accompanied by a few hundred workers, together with some stores. As the season advances, these nuclei will quickly build up, and may then be transferred to full-size hives provided with sheets of foundation.

*Wild Bees' Nests from Trees.*—When commencing on a new site, the first procedure is to find and remove all bees from bee-trees in the neighbourhood. By doing this the competition from the wild bees is eliminated, and a number of hives may be stocked at very little expense. The easiest way to find them is to make a systematic search of all water-courses and other sources of water, and any bees found obtaining water should be carefully sight-lined and their home found. The tree should be felled and the nest cavity cut open. Sometimes the shock of the fall may so disorganise the colony that it will offer little or no resistance, and may easily be transferred to a frame hive. The following is a good method for transferring the brood comb from box hives, and as a modification of this method—by omitting the drumming process to drive out the bees—is also most suitable for transferring the brood comb from wild bees' nests, it will be described in some detail.

## Transferring from Box Hives and Wild Bees' Nests.

Before commencing, the following necessary articles should be at hand:—A bucket of water, as the operator should wash the tools and his hands frequently to keep them free of honey. The hive must, of course, be ready, and the smoker lighted. A hammer and cold chisel are needed for opening the hive. A ball of thin string, a large knife, and two hammers or heavy sticks for drumming on the box hive are also required.

Smoke should be blown into the entrance of the box hive, after which it should be removed and the new hive, preferably with at least one drawn comb in it, placed exactly on the old stand to receive the returning bees. The bottom should be removed from the box hive, which

should then be placed on its side close to the new hive. With two sticks or hammers the beekeeper raps on the sides of the box hive with regular and continuous strokes. After a few raps, the bees will begin to run towards the open end and enter the new hive. The drumming should be continued for ten or fifteen minutes, until three-fourths of the bees have entered. If the queen is not seen as the bees pass in, the drumming should be continued a little longer.

One side of the box hive is now removed to expose the combs, which are cut out and laid aside until the brood is reached. A large piece of brood comb is laid flat on paper or a board and the frame (unwired) placed loosely on top. The outline of the inside of the frame is marked on the comb with the point of a knife, the frame is set aside, and the comb is cut to fit tightly in the frame. Smaller pieces may be fitted to suit, and the whole tied with a few turns of string. When all the brood comb has been transferred in this manner, the remainder of the frames to fill the hive should be filled with full sheets of foundation.

When transferring the brood comb from trees, as outlined in the preceding paragraphs, as many of the bees as possible should be shaken into the frame hive; then, if the hive is placed on or near the spot where most of the remaining bees are, they may be induced to go in with the help of a little smoke. In the evening the hive should be closed by tacking a strip of wire gauze across the entrance, after which it may be removed to its permanent position. Should the queen have been killed, the bees will make several queen cells, and another queen will hatch out about the sixteenth day.

After transferring is finished, all scraps of comb and wax should be cleaned up to prevent robbing, and, if necessary, some of the honey should be given back to the bees for stores. After a few days the bees will have securely fastened the combs, and the strings may be removed. As the bees become established on the newly-built combs, the frames of transferred comb are gradually worked to the outside of the cluster of bees, then finally withdrawn and melted for wax.

## Moving Colonies of Bees.

Bees remember a location so well that some difficulty is encountered by the beginner in moving them to a new stand. They may, however, be moved to a distance of 1½ miles or more without danger of their returning, because they will have to learn their surroundings before they can venture far from the hive. When it is desired to move them to a fresh spot a short distance from their old position, much more difficulty is encountered. For instance, if the hive should be moved 30 or 40 feet away, the returning field bees will fly straight to the spot previously occupied by their hive and hover there, hopelessly lost. There are two methods for successfully moving colonies a short distance. One is to move the hive a few inches daily, when the bees do not realise that they are being moved; the other method is to shift them several miles away for a week or two, by which time they will have forgotten the old site, after which they may be returned to any desired position in the old yard.

Bees excited by moving or any other disturbance generate a great deal of heat. During hot weather the hive cover should be removed and a "moving screen" substituted. This consists of a screen wire top

in the place of a regular hive cover. It allows the escape of excess heat that might melt the combs and kill the bees. The temperature may be greatly reduced and the bees quieted if a litle water is squirted into the hive through the screen.

### Feeding Bees.

In many Queensland localities January appears to be a sterile month. If the spring honey flow has been extracted and is followed by a shortage for a month or so, about January the colonies begin to get weak. It is quite probable that the flow will again come on in the autumn, and, unless the bees receive some help, they will be too weak in numbers to gather any surplus. The only remedy is immediate feeding, either with honey or sugar syrup. Owners of bees in this condition have communicated with the Department, being under the impression that the bees were diseased. A visit to their apiaries, however, showed that the bees were quite healthy, but literally starving.

For summer feeding, half sugar and half water by measure will do very well. This should be fed to the colonies at the rate of half a pint a day, to keep brood-rearing going.

### Beekeeping an Exacting Calling.

In conclusion, emphasis should be placed on the fact that it is not sufficient merely to buy some colonies of bees and let them forage for nectar, robbing all their surplus honey whenever they have accumulated any. This treatment will only lead to failure, which almost always results from a lack of study of the needs of the bees combined with neglect to perform the necessary manipulations on time. The successful beekeeper is a student of bees, adapting his practice to changing seasons, and knowing what to expect from his bees under a given set of conditions.

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## QUEENSLAND SHOW DATES, 1933.

Dalby: 5th and 6th April.
Beenleigh Campdraft: 8th April.
Oakey: 8th April.
Chinchilla: 11th and 12th April.
Boonah Campdraft: 17th April.
Miles: 19th April.
Nanango: 20th and 21st April.
Tara: 26th April.
Kingaroy: 27th and 28th April.
Goondiwindi Campdraft and Show: 28th and 29th April.
Taroom: Campdraft, 1st; Show, 2nd and 3rd May.
Wondai: Campdraft, 1st and 2nd May; Show, 4th and 5th May.
Boonah: 3rd and 4th May.
Monto: 3rd and 4th May.
Blackall: 9th to 11th May.
Charleville: 9th and 10th May.
Beaudesert: 10th and 11th May.
Mundubbera: Abandoned.
Murgon: 11th to 13th May.
Ipswich: 16th to 19th May.
Mitchell: 17th and 18th May.
Gayndah: 17th and 18th May.
Goomeri: 18th and 19th May.
Kilkivan: 22nd and 23rd May.
Roma: 23rd to 25th May.
Gympie: 24th and 25th May; Campdraft, 27th May.
Biggenden Sports: 26th May.
Toogoolawah: 26th and 27th May.
Kalbar: 27th May.
Maryborough: 30th and 31st May, and 1st June.
Callide Valley: 2nd June.
Marburg: 3rd to 5th June.
Childers: 5th and 6th June.
Wowan: 8th and 9th June.
Bundaberg, 8th, 9th, and 10th June.
Lowood: 9th and 10th June.
Gladstone: 14th and 15th June.
Rockhampton: 20th to 24th June.
Mackay: 27th to 29th June.
Laidley: 28th and 29th June.
Kilcoy: 29th and 30th June.
Bowen: 5th and 6th July.
Gatton: 5th and 6th July.
Woodford: 6th and 7th July.
Ayr: 7th and 8th July.
Cleveland: 7th and 8th July.

# IMPORTANCE OF SUBSOIL MOISTURE IN COTTON-GROWING.

By W. G. Wells, Director of Cotton Culture.

THE greatly reduced yields which many cotton-growers are obtaining in the 1932-33 season as compared to what it appeared they might get, based on the prospects for the crops earlier in their development, amply demonstrate the necessity for successful cotton-growing of a good supply of moisture in at least the upper 18 to 24 in. of soil. Broadly speaking, while the rainfall was somewhat light and irregular in many sections of the cotton belt, in nearly all the main districts ample rain fell in some parts to have been sufficient to produce good yields of cotton. Unfortunately, periods of severely high temperatures were experienced at three critical stages in the development of the plants, which seriously affected not only the yield but the quality of the fibre produced. Undoubtedly, if there had been ample subsoil moisture many crops would have withstood the heat waves sufficiently to have produced much better yields of cotton of good quality than were obtained. The problem confronting the growers is, therefore, what method of preparation of the seed-bed for the next crop will offer the greatest assistance in preventing a repetition of the disastrous results of this season.

## Moisture Requirements of a Cotton Plant.

Before discussing this problem, it is pointed out that the rooting system of the cotton plant is of the tap-root type, and therefore removes considerable moisture from the subsoils. It follows, therefore, that where cotton is grown on the same land for several years in succession, a good replenishment of subsoil moisture is required each season, either prior to planting the crop or during the early period of growth before sufficient bolls and squares are developed to cause much stress to the plant during dry periods or heat waves. In an endeavour to ascertain how severely a cotton crop would lower the moisture content of the soils, a plot at the Cotton Research Station, Biloela, which was fallowed all the season of 1931-32, was planted—half to cotton and half clean fallowed in the 1932-33 season. Soil moisture determinations made throughout the 1931-32 season, when the whole plot was in clean fallow, indicated that there were no significant differences existing between the moisture contents of the two length-wise halves of the plot. These determinations were continued throughout the 1932-33 season, and the graphs in fig. 1 illustrate quite definitely how the cotton crop lowered the moisture content at the 4-6 in., 10-12 in., and 16-18 in. levels, where the soil samples were taken.

It is pointed out that this cotton crop was grown on land fallowed for about fifteen months. Had it followed a cotton crop, there would have been less moisture at all levels at the commencement of the season, for only light winter rains occurred in 1932, hence much lower percentages would have been shown all the season on the graphs for the two lower levels in the cotton portion of the plot in 1932-33. It can be realised, therefore, just what the subsoil moisture situation is now in most fields where cotton has followed a cotton crop of last season.

## How to Obtain Subsoil Moisture.

It would appear that the best way to overcome this deficiency of subsoil moisture for the coming season, unless a very wet winter is experienced, would be to plant cotton on either newly cleared land where the timber has been dead for some seasons, or on old cultivated land which has been either in clean or grassy fallow or in some summer-grown fodder crop. In many of these three classes of cultivation not only is it highly probable that much more moisture will be found at ploughing time in the upper 18 in. of soil than in land where cotton has been grown this season, but there is the added advantage that ploughing can be done before the winter rains occur. Marked gain of subsoil moisture is obtained where this practice is followed, for not only is some of the late summer rainfall conserved, but the early winter rains penetrate the upper soils to better advantage than is the case with unploughed land.

## Benefits Obtained by Early Ploughing.

The benefits to be gained through ploughing in late March, April, or May have been studied over a series of seasons at the Cotton Research Station. The results obtained there indicate that with ordinary June rains of 2 to 3 in., increased yields may be realised through ploughing in the abovementioned months, especially if only light rainfall is experienced during the following season. In dry winters or wet springs the advantage of early ploughing may be reduced, depending on the nature

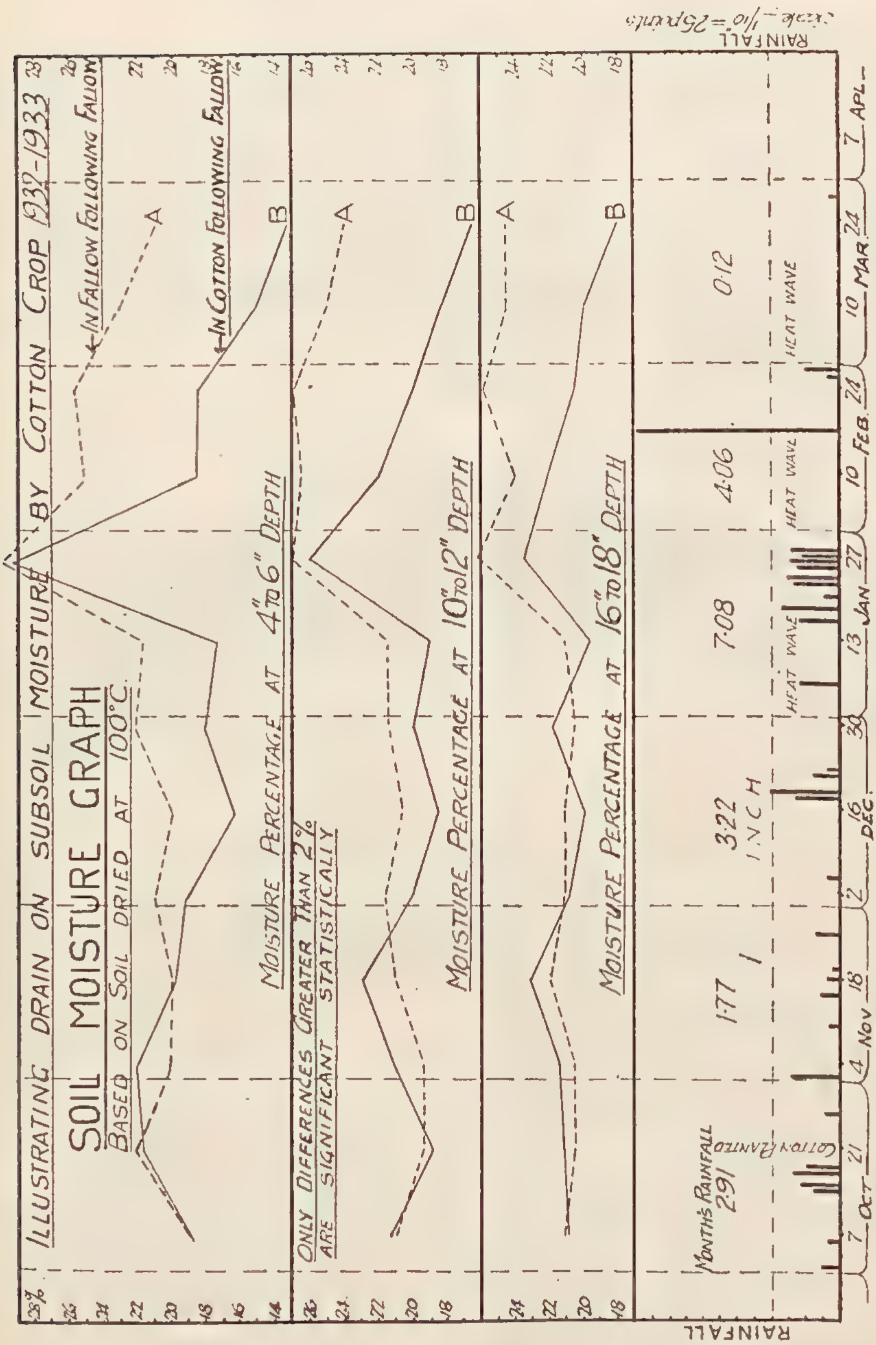


PLATE 43 (Fig. 1).

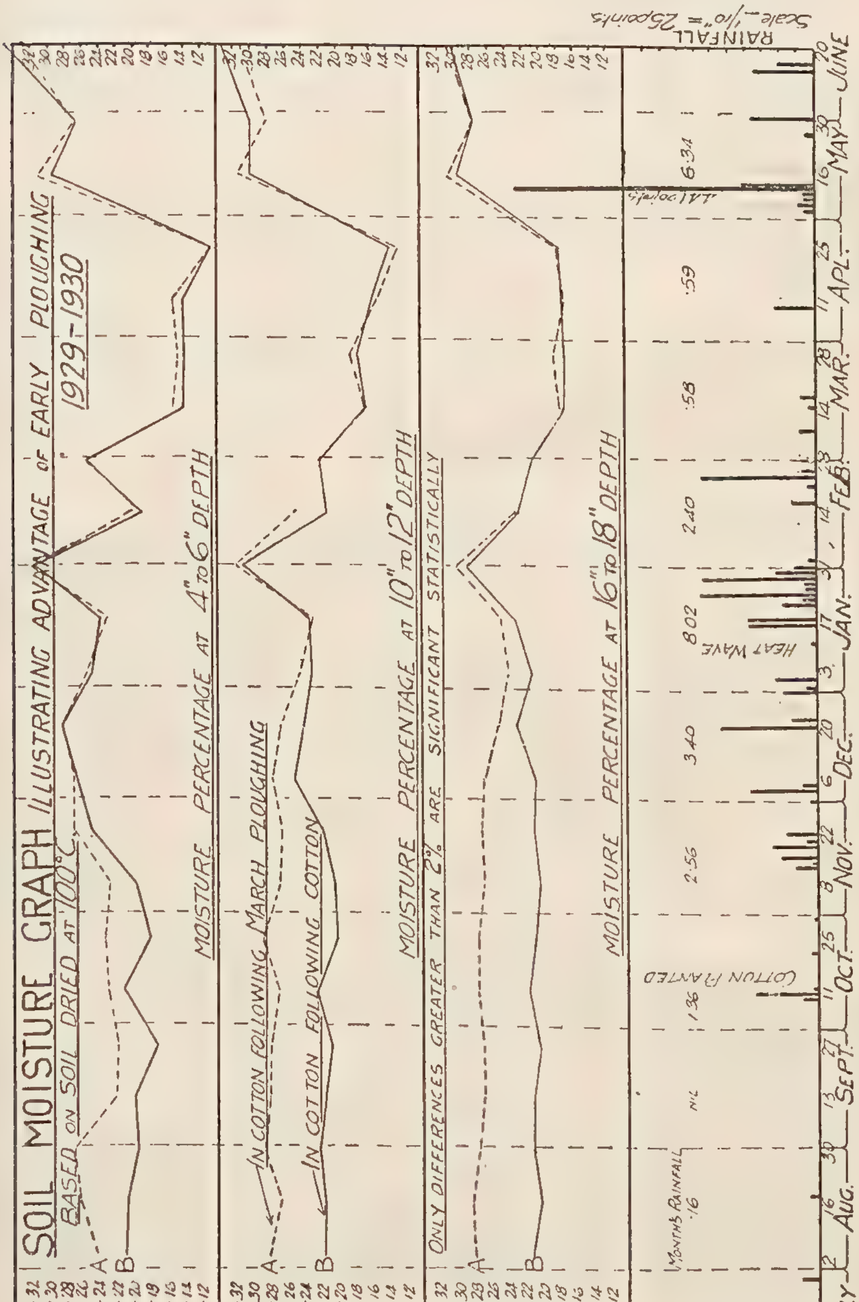


PLATE 44 (Fig. 2).

of the soil and the mid-seasonal rainfall. The graphs in fig. 2 show the marked gains obtained at the 4-6 in., 10-12 in., and 16-18 in. levels in the early ploughed plot prior to planting and during the early period of development of the plants in the 1929-30 season, although only 1.83 in. of rain occurred in June, and a total of .44 in. in July, August, and September. Planting was done on 15th October following 1.26 in. scattered over five days. Good stands were obtained, which were maintained with a good steady growth in the early ploughed plot, but were lost so severely through drought and false wire worm attack in the cotton following cotton plot that it was necessary to replant this in mid-November. The plants on the early-ploughed plot maintained their superiority all season, and outyielded the other plot by 550 lb. seed cotton per acre.

### Grow Cotton in Rotation with other Crops.

It is strongly advocated that cotton be grown in a system of crop rotation, whereby it will be possible to plough the land for the following cotton crop not later than in April or May. It is appreciated that where growers have acreages of 80 to 100 acres, this may entail growing too much summer crops for their requirements, and in such cases it is recommended that at least half of their cotton acreage be planted on early-ploughed land following a summer fodder crop. Where this is done, it will be necessary to plough only 40 to 50 acres of the old cotton land, and in most seasons, if the removal of the old crop is hastened, ploughing of this acreage could be effected in time to conserve a considerable amount of the winter rains. Where growers intend planting less than 40 acres of cotton, it is believed that over a series of seasons decided gains will result if the cotton crop is planted on land that has been ploughed in late March, April, or May, especially if good winter rains occur.

### Suitable Rotations for Cotton-growing.

The most suitable crops for growing in rotation with cotton depend on the soil types and the system of farming with which it is combined. If with dairying, it appears that on rich alluvial soils cotton can follow sorghums, panicums, and maize, or any grass crops. It is pointed out that in many of the alluvial loams or clay loams of the older cultivations, especially in the Callide Valley, the Upper Burnett, and the coastal areas, the nitrogen content is somewhat high for successful cotton-growing in a season of late planting and very heavy mid-seasonal rains. Cotton should not follow lucerne, peanuts, cowpeas, or any legume on such soils, as these crops definitely increase the nitrogen content to the point where the plant foods are in too unbalanced a condition. The grass crops use a lot of nitrogen, however, and where a soil is suspected of being too rich for cotton, several crops of saccaline, imphee, or sudan grass should be grown to reduce the nitrogen content. A nice illustration of the benefit to be obtained from following such a practice was seen this season in a commercial crop where each row was partly on land which had grown sorghums for several seasons, and partly on land which had been under lucerne. The plants on the sorghum land were heavily fruited, red stalked, with light-yellowish green leaves, of a desired open type, free of serious insect attack, and would have been even better with a heavier seasonal rainfall. The plants on the lucerne land were in marked contrast, being taller, of coarser denser growth, with large dark-green succulent leaves, and bore practically no bottom or lower middle crop due to heavy rough boll worm and corn-ear worm attacks, and a wetter season would probably have ruined the yield entirely.

It is not recommended that rotations including only fodder crops and cotton be used on the poorer clay and clay loam forest slopes, such as those originally covered with ironbark or a mixture of ironbark and box-trees, particularly in the South and Central Burnett and Central Districts. These soils appear to be admirably suited for the production of hardier big boll types of cotton, but the heavy mid-seasonal rains undoubtedly wash an appreciable amount of their fertility into the alluvial flats. Growing only cotton and sorghums or panicums on these soils would, therefore, further reduce their fertility to the point where plentiful and regular rainfall would be required for the production of profitable yields of any of these crops. It is suggested, therefore, that on such soils, after they have been in cultivation for some time, a rotation of cowpeas followed by a sorghum or panicum to reduce some of the nitrogen developed when the cowpeas were growing is advisable before planting cotton.

### Suitability of "New Country" Cultivations.

An interesting result has been obtained in all of the main cotton-growing areas whenever cotton is grown on new cultivation, either in forest or scrub soils. The usual practice is to burn out the old stumps and grass, and skim-plough to destroy the grass roots, after which, in about four to six weeks, another ploughing to a depth

of 6 in. is made to turn under all trash, &c. Sometimes the seed-bed is not prepared until nearly planting time, yet provided good planting rains are obtained, excellent strikes are secured, which nearly always produce profitable yields, either in seasons of light rainfall or ones with very heavy rains, although adjacent old cultivations on similar soil may yield very unprofitably. The explanation of such results is not entirely clear. Investigations conducted at the Cotton Research Station indicate that the new soils have a markedly lower nitrate content and a much higher carbon-nitrate ratio than after they have been under cultivation for four or five years. It is also possible that the humus in the new land may help to increase the moisture-carrying capacity of the upper soils. The value of planting on the new cultivations is most marked, however, even in the second, and sometimes third, season. It is possible that a rotation of grass land and cotton on the richer forest and scrub clay and clay loam soils may be one of the best that dairymen can use. Investigations are now being carried out to ascertain the value of growing cotton on land that has been growing Rhodes grass for three years, following several years of cotton. It is appreciated that the cost of cultivation will be higher in the first season on account of the grass seedlings, but if the "new country" effect can be obtained with such a rotation, it is believed that it will be highly advisable to practice it, for Rhodes grass is a valuable asset on any farm. Where newly stumped scrub country that has been in Rhodes grass for several seasons is brought into cultivation, good yields of cotton are nearly always obtained, and it is possible that this rotation may be the solution of the problem of overcoming the tendency for cotton crops to "bolt" on the rich soils during seasons of heavy rainfall.

It may also be of decided value in respect to time of planting. Experiments lasting over several seasons have shown conclusively that on the older cultivations of the richer alluvial loams and clay loams, September and October plantings offer much better chances of producing heavy yields than do plantings in November and December. In a wet season the latter plantings often are so seriously attacked by corn-ear worm that nearly complete failure results. The later plantings on newly cleared land, however, generally produce profitable crops, and appear to be able to withstand the occurrence of a wet mid-season to a marked extent.

### Value of Long Fallows.

It has been suggested at different times that the cotton-growers would be well advised to practice long fallowing, such as is carried out by the wheatgrowers in the Southern part of Australia. The results obtained from experiments conducted at the Cotton Research Station do not bear out these recommendations, and it is doubtful if any monetary advantage would be gained by growing cotton in rotation with a long fallow. During dry seasons on some soils a substantial gain in yield per acre would undoubtedly be obtained. It is pointed out, however, that the cost of the fallowing has to be borne by the cotton crop, and this will be considerable, for it is necessary to maintain a clean fallow, otherwise couch grass will become well established on most alluvial soils. It is likewise possible that long fallowing the fertile alluvial soils may excessively increase the nitrates, and if a wet season should be experienced in the following year, rank growth, accompanied by corn-ear worm and sucking insect attacks, would probably result.

It is not recommended, therefore, that long fallowing be practised. While, undoubtedly, the rainfall during the period 1929-30 to 1932-33 has been such as to put a heavy premium on the method giving the greatest storage of subsoil moisture, it is believed, based on the rainfall records of the last sixty years, that a system of rotation of crops such as has been suggested will provide ample subsoil moisture. Not only is it advisable from this aspect to grow cotton in rotation with other crops, but good farming practices likewise demand it. The ill effects from not following proper systems of crop rotations, that are being experienced in other countries with older cultivations than here in Queensland, amply demonstrate the dangers of growing the same crop on a soil for several years in succession. There, soil erosion and crop depletion of the plant foods have reduced the fertility of the soils to the point where applications of as much as 1,000 lb. of fertilizer per acre yield profitable results in some parts of the cotton belt in the United States of America.

In addition to this feature of crop rotation, it is also pointed out that in seasons when heavy attacks of the false wire worm (*Gonocephalum* sp.) are experienced, considerable protection is given to the young cotton seedlings on soils where crop rubbish, such as maize stalks, panicum stubble, &c., is ploughed under. The larvæ of this pest feed on decaying vegetable matter, and where early ploughing has conserved moisture with the vegetable matter little damage is usually experienced. This was nicely demonstrated at the Cotton Research Station in the 1929-30 season, when all the cotton plots following summer fodder crops escaped with little or no damage, while in adjacent cotton following cotton plots the stands were either destroyed or so badly reduced as to prevent the maximum yields being obtained.

**Conclusions.**

1. The cotton plant has a root system of the deep tap-root type, which exhausts the subsoil moistures to a marked extent, especially during a season of light rainfall following a dry winter.

2. It is advisable, therefore, to grow cotton in rotation with shallow-rooted fodder crops, which can be harvested in time to allow of ploughing in late March, April, or May.

3. Experiments at the Cotton Research Station have demonstrated that ploughing during this period not only helps to conserve the late summer rainfall, but assists most decidedly in obtaining greater benefit from any winter rains that may occur.

4. Where large acreages of cotton are grown, it is advisable that at least half of the area be planted on early-ploughed land following a summer crop. Only half of the old cotton land would thus be required for the new crop, and usually this could be ploughed in time to conserve an appreciable amount of any winter rains occurring.

5. Rotations of either sorghums and cotton, panicums and cotton, or maize and cotton are suitable for the rich alluvial soils.

6. Rotations of either cotton, cowpeas, and sorghums, or cotton, cowpeas, and panicum are suitable for the poorer alluvial soils and clay or clay loam forest slopes.

7. During the first two or three seasons after either forest or scrub soils are brought under cultivation, profitable yields of cotton can be confidently expected under a wide range of climatic conditions.

8. It is possible that on the rich alluvial and scrub soils a rotation where three years of Rhodes grass is followed by one year cotton, one year maize or panicum, and one year cotton, after which the land will be put back again into Rhodes grass for three years, may likewise be of marked value under a wide range of climatic conditions.

9. Ploughing early to a depth of 6 in. and preparing the seed-bed by the end of July, if possible, will give gains in yields over a series of years.

10. Late cross-ploughing should be avoided, if possible—it drys out the upper soils, and thus necessitates very good planting rains being experienced if the cotton seedlings are to be able to withstand early dry conditions.

11. If it is necessary to follow cotton with cotton, it is advisable to cut and burn the old stalks, and plough as early as possible. The new crop should be planted in the middles between the old rows, rather than again on top of them.

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## WHEAT PRICES.

The following table, compiled from figures supplied by the New South Wales Government Statistician, show the average yearly price for wheat on the Sydney market since 1890:—

| Year. | Average Price for Year. | Year. | Average Price for Year. | Year. | Average Price for Year. | Year. | Average Price for Year. |
|---|---|---|---|---|---|---|---|
| | s. d. | | s. d. | | s. d. | | s. d. |
| 1890 .. | 3 7¼ | 1901 .. | 2 8 | 1912 .. | 4 1 | 1923 .. | 5 3½ |
| 1891 .. | 4 3 | 1902 .. | 4 5 | 1912 .. | 3 2¼ | 1924 .. | 5 5 |
| 1892 .. | 4 8½ | 1903 .. | 5 1¾ | 1914 .. | 4 1½ | 1925 .. | 6 2¼ |
| 1893 .. | 3 6½ | 1904 .. | 3 2 | 1915 .. | 5 5 | 1926 .. | 6 2 |
| 1894 .. | 2 9½ | 1905 .. | 3 5 | 1916 .. | 4 10 | 1927 .. | 5 5 |
| 1895 .. | 3 4 | 1906 .. | 3 3½ | 1917 .. | 4 9 | 1928 .. | 5 1¼ |
| 1896 .. | 4 3¼ | 1907 .. | 3 10 | 1918 .. | 4 9 | 1919 .. | 4 6¼ |
| 1897 .. | 4 5¾ | 1908 .. | 4 3½ | 1919 .. | 5 1½ | 1930 .. | 3 10¼ |
| 1898 .. | 3 8 | 1909 .. | 4 9 | 1920 .. | 8 7¼ | 1931 .. | 2 4½ |
| 1899 .. | 2 9 | 1910 .. | 3 10 | 1921 .. | 8 8 | 1932 .. | 3 0¾ |
| 1900 .. | 2 8½ | 1911 .. | 3 6 | 1922 .. | 5 8 | | |

# ABNORMAL FERMENTATIONS IN MILK AND CREAM.

By O. St. J. KENT, Dairy Branch.

*Each month an article dealing with one of the milk fermentations will be published, in order that the dairy farmer may gain information about those processes which continually militate against him in his efforts to produce high-quality milk and cream.—Ed.*

MILK and cream, along with other dairy products, are very susceptible to processes known as fermentations. These processes may produce lactic acid, gassiness, ropiness, colour change, differences in flavour and aroma, sweet curdling, and other defects which are usually so detrimental to the quality of the milk and cream as to convert them into second or lower-grade products. Milk and cream of low grade mean lower prices to the farmer and lower quality butter and cheese.

A fermentation in milk may therefore be described as a process which brings about one or more of the changes mentioned above, as a result of the activity of microbes.

### Normal and Abnormal Fermentations.

Fermentations may be divided into two groups, the normal and abnormal. The most common change occurring in milk is the souring of milk or the development of lactic acid, with its subsequent coagulation of the casein. The process which brings about the change is known as the lactic acid fermentation, and on account of the regularity with which this change takes place it is looked upon as the normal fermentation of milk. Those processes which bring about other changes in milk, such as gassiness, ropiness, &c., are known as the abnormal fermentations of milk.

It frequently happens that milk or cream may develop more than one type of fermentation. Gassiness may occur along with a bad flavour, or ropiness may appear at the same time as a bad flavour. Such mixed fermentations may be caused by the one organism or as a result of the combined efforts of more than one organism. The activity which one group of microbes may display is exemplified by the Escherischia-Aerobacter group. This one group has been shown to produce acidity, gassiness, off flavours and aromas, and even ropiness in milk.

## ROPINESS OR THE ROPY FERMENTATION.

Ropiness in milk and cream is brought about by bacteria or microbes, which so change the consistency of these products that they can be drawn out into threads or masses. The extent of this defect varies considerably. Sometimes the change is so slight that it can scarcely be detected, whilst in other cases the milk or cream can be drawn out into long threads a yard or more in length and as fine as silk. Sometimes it assumes a doughy consistency, and is so viscous that a vessel containing it can be inverted without spilling. If ropiness is at all pronounced in cream it can be detected by passing a fork or spoon through it, when the threads will be readily observed.

### Ropy and Gargety Milk.

It is essential to point out the difference between ropy milk and milk infected with garget. Gargety milk is milk from abnormal udders, and is due to masses of fibrin and leucocytes thrown out by the udder tissues in response to an infection. In ropy milk the consistency is due solely to the growth of bacteria in what was originally a normal product. Gargety (or stringy) milk shows the abnormal condition at the time it is drawn, and if not evident from the appearance of the milk itself, it is commonly recognised by the material collecting on the strainer cloth.

Ropiness does not show until at least twelve hours after the milk has been drawn.

### Importance of Ropiness.

Ropiness is one of the common abnormal fermentations of milk and cream. It causes annoyance to all persons concerned, but mostly to the producer himself. In case of delivery of milk for household consumption, the milk may appear quite normal when delivered, but ropiness may show up after being held for a time by the consumer. The consumer very often assumes that the ropy condition is brought about by some disease in the producing animal, and unless the producer can quickly control the trouble, a big loss of customers is likely to take place. As a matter of fact the organisms causing ropiness appear to be harmless to human beings. In butter and cheese manufacture ropy milk and cream are undesirable on account of the serious defects in quality they are likely to produce.

### Organisms Causing Ropiness.

The organism usually causing this defect is *Bacterium viscosum*, which was first isolated from water. It has been often isolated from ropy milk, and is considered to be the most common cause of ropy milk. *B. viscosum* is an organism that requires air for its development, so that ropiness is more often detected in the cream on milk which has been allowed to stand. The organism grows at fairly low temperatures, such as 50 degrees F., although growth is faster at higher temperatures. It has been shown that the organisms secrete gums and mucins, substances which are responsible for the ropy condition which is characteristic of this fermentation.

In addition to *B. viscosum* there are other organisms which produce ropiness. The Escherichia-Aerobacter group have been shown to be the cause of many epidemics of ropiness. This group also produces acid and gas, but when ropiness is present the acidity and gas is not very greatly pronounced.

Quite a number of other organisms have been shown to produce ropiness, but their importance is not so great as *B. viscosum* and the Escherichia-Aerobacter group.

### Sources of Ropiness.

The source of the organism is of great importance in any epidemic of ropiness. The original source is often difficult to trace, because once the organism becomes established it contaminates all utensils and material that come in contact with the milk. Many sources have been examined during investigations of ropiness. Milk within the udder has been shown to be free of ropy oroganisms, and is not considered to be a likely source. The organism therefore infects the milk from some external source.

Surface waters have been shown to be a frequent source of ropiness. The coats, flanks, and udders of cows become contaminated, and during milking material falls into the milk from the flanks and udders. In addition to surface water on the farms, water from troughs, cooling tanks, and similar places must be considered as likely sources. The utensils naturally become a source of the trouble unless great care is taken in the cleaning and scalding of them.

### Control of Ropiness.

It is necessary to deal with the original source of the trouble before ropiness can be effectively controlled. Thorough cleansing and scalding of utensils will only give temporary relief unless the original cause is removed. It is necessary then, first of all, to move all cows from low-lying lands holding surface water to higher and better drained paddocks. Having done this, attention should be given to the utensils. Thorough cleaning and scalding with plenty of boiling water will usually get rid of this trouble. Attention should then be given to the flanks and udder of the cow, which should be properly cleaned with a clean rag and non-odourous disinfectant solution. The control of a ropy milk outbreak is not an easy matter, as there is very likely to be a recurrence of the epidemic if attention to details is neglected.

Pasteurisation of milk will prevent the development of the organism, but pasteurisation plants do not like accepting ropy milk on account of the trouble it is likely to cause. Pasteurised milk has been known to develop ropiness, but it has been traced to contamination from the plant equipment. As on the dairy, the method of control in factory or milk plant involves thorough cleansing and disinfection of the parts affected.

# ONION TRIALS IN CENTRAL QUEENSLAND.

By C. S. CLYDESDALE, Senior Instructor in Agriculture.

IN Central Queensland the seasonal period suited for the production of onions is of shorter duration than in the southern portion of the State, and invariably terminates during the plant's latter stages of growth with warm to hot weather and a pronounced scarcity of rain.

The object, consequently, in establishing onion trials in the Central District was to discover a variety of early maturing habits and reasonably good keeping qualities. Early maturity was desired to allow of maximum bulb development during the cool winter and more congenial months, and to provide supplies of onions for the Central and Northern markets in advance of Southern consignments.

### 1930 Trials.

The varieties experimented with were as follows:—

Brown Spanish;
Extra Early Golden Globe;
Silver King;
Early Barletta;
Odourless.

Two American varieties were also included in the original trials, but the seed, unfortunately, arrived late in the season, and was planted on land which could not be irrigated. A good germination was secured, but the resultant bulbs only attained a diameter of approximately 1¼ inch. Since the area under crop was materially very small, the yields were not computed.

Six plots were arranged for on the following farms, in the respective districts:—

| | |
|---|---|
| R. E. Wilmott | Theodore |
| J. A. Bowman | Theodore |
| J. E. Freeman | Theodore |
| R. A. Lees | Theodore |
| Brown and Sons | Archer |
| A. E. Fisher and Sons | Gracemere |

The Archer plot was watered by the spray irrigation while those in the Theodore district were watered by the flood system. These plots were planted during the latter end of March, and the Gracemere area was sown in May.

With the exception of Odourless, which failed, a very satisfactory germination was obtained from the respective varieties in all plots. The rainfall during growth was the best received for several years and, forced by irrigation, a large proportion of the crop developed thick necks and ran to seed, several of the trials thus being rendered valueless, and were not harvested.

The seeding appears to have been characteristic of the crops in other portions of the State, and may have been the result of seasonal conditions accentuated, in the case of the trial plots, probably by very early planting.

### Results.

R. E. WILMOTT, THEODORE.

Sown .. .. .. .. .. 25th March, 1930
Harvested .. .. .. .. 17th November, 1930

| Variety. | Tons per Acre. | Smaller Ill-shaped. | Marketable. |
|---|---|---|---|
| Brown Spanish | 14·12 | ·10 | 14·02 |
| Extra Early Golden Globe | 15·8 | 1·5 | 14·3 |
| Silver King | 8·2 | 3·6 | 4·6 |
| Early Barletta | Not harvested | | |

Rainfall: 15.81 inches.

Irrigated previous to planting and six weeks previous to harvesting.

A. E. FISHER AND SONS, GRACEMERE.

Sown .. .. .. .. .. 3rd April, 1930
Harvested .. .. .. .. 7th December, 1930

| Variety. | Tons per Acre. | Smaller Ill-shaped. | Marketable. |
|---|---|---|---|
| Brown Spanish .. .. .. .. .. | 8·4 | Negligible | 8·4 |
| Extra Early Golden Globe .. .. .. | 11·8 | Not computed | 11·8 |
| Silver King .. .. .. .. .. | 7·4 | ·5 | 6·9 |
| Early Barletta .. .. .. .. .. | 6·8 | ·3 | 6·6 |

Rainfall: 20.24 inches.

Of this total 15.25 inches fell within seven weeks of sowing.

**Remarks.**

*Brown Spanish.*—Fairly uniform, firm, and good keeper; good marketable shape.

*Extra Early Golden Globe.*—Fairly high percentage of oversized and split bulbs, lacking uniformity, but firm.

*Silver King.*—Large proportion thick necks, split, and bad shape; soft and poor keepers.

*Early Barletta.*—This variety and Silver King being very prone to seed; poor keepers; only serviceable where immediate local sale is available.

These trials confirm results obtained from previous season's trials, and the conclusion drawn from such plots seems to indicate that, even under favourable Central Queensland weather conditions, the growing of onions, except where irrigation is practised, is too precarious to be recommended.

It was also observed that the strains of seed used in Departmental trials varied from the results obtained by the use of other strains and planted commercially, and the 1931 season's trials were designed to test strains from various sources. The trials were confined to irrigated areas, and were located on the properties of Messrs. R. E. Wilmott and J. B. Freeman, respectively. Strains of the variety Brown Spanish were used.

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**1931 TRIALS.**

R. E. WILMOTT, THEODORE.

Sown .. .. .. .. .. 6th April, 1931
Harvested .. .. .. .. 11th November, 1931

| Strain. | Origin. | Strike per Yd. | Yield. Tons per Acre. | Percentage. | |
|---|---|---|---|---|---|
| | | | | Large. | Small. |
| Hunter River Early .. .. .. .. | A | 7·5 | 15·62 | 88 | 12 |
| Ditto .. .. .. .. .. | B | 6·0 | 10·93 | 41 | 59 |
| Ditto .. .. .. .. .. | C | 7·6 | 15·64 | 76 | 24 |
| Ordinary .. .. .. .. .. | A | 5·4 | 8·98 | 66 | 34 |
| Ditto .. .. .. .. | B | Not harvested | | | |
| Long Keeping .. .. .. .. | A | Failure—Ran to neck | | | |

Rainfall: 13.89 inches.

Irrigated previous to planting and on 30th August, 1931. Bulbs having formed during August.

## J. E. FREEMAN, THEODORE.

### FIRST PLANTING.

Sown .. .. .. .. .. 5th May, 1931
Harvested .. .. .. .. 12th November, 1931

| Strain. | Origin. | Strike per Yd. | Yield. Tons per Acre. | Percentage. Large. | Percentage. Small. |
|---|---|---|---|---|---|
| Hunter River Early .. .. .. .. | A | 7·8 | 13·68 | 74 | 26 |
| Ditto .. .. .. .. .. | B | 7·3 | 13·68 | 73 | 27 |
| Ditto .. .. .. .. .. | C | 8·6 | 13·32 | 75 | 25 |
| Ordinary .. .. .. .. .. | A | Ran to neck, unsuited for market, and not harvested. | | | |
| Ditto .. .. .. .. .. | B | | | | |
| Long Keeping .. .. .. .. | A | | | | |

Rainfall: 11.84 inches.

Irrigated previous to planting, and on 2nd July, 1931, 3rd August, 1931, and 1st September, 1931.

### SECOND PLANTING.

Sown .. .. .. .. .. 5th June, 1931
Harvested .. .. .. .. 14th January, 1932

| Strain. | Origin. | Strike per Yd. | Yield. Tons per Acre. | Percentage. Large. | Percentage. Small. |
|---|---|---|---|---|---|
| Hunter River Early .. .. .. .. | A | 7·3 | 10·21 | 85 | 15 |
| Ditto .. .. .. .. .. | B | 7·5 | 10·43 | 85 | 15 |
| Ditto .. .. .. .. .. | C | 8·1 | 11·12 | 90 | 10 |
| Ordinary .. .. .. .. .. | A | Ran to neck. | Not harvested. | | |
| Ditto .. .. .. .. .. | B | | | | |
| Long Keeping .. .. .. .. | A | | | | |

Rainfall: 14.04 inches.

Irrigated after sowing (5th June, 1931) and 10th August, 1931, 11th September, 1931, and 13th October, 1931.

### COLLECTIVE RESULTS.

| Strain. | Origin. | Average Yield. |
|---|---|---|
| Hunter River Early .. .. .. .. .. .. .. | A | 13·17 |
| Ditto .. .. .. .. .. .. .. .. | B | 11·68 |
| Ditto .. .. .. .. .. .. .. .. | C | 13·36 |
| Ordinary .. .. .. .. .. .. .. .. | A | 8·98 (one plot only) |
| Ditto .. .. .. .. .. .. .. .. | B | — |
| Long Keeping .. .. .. .. .. .. .. | A | — |

**Conclusion.**

Summarising the results of the trials of the different strains and varieties, the final figures prove conclusively that the Hunter River Origin C strain has produced onions of good marketable quality and high yielding capacity.

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**If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.**

# WOOLCLASSING FOR MARKET.

By J. L. HODGE, Instructor in Sheep and Wool.

SHEARING time is harvest time for the grazier, and the utmost care should be taken to see that the clip is so prepared for market as to ensure full value.

It may be taken as a definite fact that the employment of a first-rate man is not only necessary, but profitable to the grower. Apart from the technical knowledge necessary, it is essential that a classer should have other qualities just as important for the smooth and profitable working of a shed. He should be a good man over men, tactful but firm, and with full shed experience. A correct interpretation of classing would be to state that the classer is there to so display the wool for sale honestly that the best financial results will accrue to the owner, and that the buyer, acting for his principals, may, with the least trouble possible, value the wool offered. Should faulty fleeces creep into the lines through indifferent classing, the value to the owner is depreciated by virtue of the fact that the buyer will estimate value on the worst wool in a line displayed for sale. Hence, it is safe to say that when in doubt of the merits of a fleece that fleece should be classed down and not forced up. This practice should follow right through the clip from top lines to stains and locks.

The classes should be determined by the wool available, and every endeavour should be made, where possible, to avoid star lots.

Employ only first-class men in the capacity of woolclassers. Others cost the owner the same amount of money, and may do the clip much harm financially. A good man makes for the owner a great deal more money than his wages.

## The Classer's Job.

It should be the endeavour of the classer to get his lines of fleece wool as even as possible, having regard to condition, quality, yield, colour, length, &c.

The number of fleece classes depends entirely upon the size of the flock operated upon and the evenness or otherwise of the wool cut. With a station clip as many lines may be safely made as the conditions demand, on account of the fact that one has the quantity of wool to work on. This does not always apply with the selector's clip, and overclassing in this case is a distinct mistake. Five bale lines, however, should be turned out when this is possible. Some of the most faulty work in a shed nowadays is to be noticed in the skirting, and this does not only apply in the matter of careless work, but also in the matter of overskirting. This work is often, too often, performed by unskilled men who treat every fleece in the same manner unless checked by the classer. Every pound of wool needlessly removed from the fleece means a distinct loss per lb. of the amount of the difference between the prices realised for broken and fleece wool. Too often one sees a clip so classed that the number of bales of broken and pieces taken together aggregate as much as the fleece wool. In ninety cases out of one hundred this is wrong, and may be put down to overskirting. Certain circumstances demand different treatments. For instance, in the case of burr or seed in wool it becomes necessary to free the fleece, if possible. Here heavy skirting is right, but there is a definite reason for it.

## Piece-picking.

Piece-picking is an important part of the operation to which, generally speaking, insufficient care is given. Here, again, in many cases, the work is carried out by unskilled hands. It is the duty of the classer to carefully watch this work. Badly picked pieces showing stains are a direct loss. As this phase of the work is probably the most hurried in the shed, it is a distinct advantage to employ, when possible, men accustomed to the work.

The belly wool should be carefully gathered from the board and shaken free of locks and fribs. In the case of wether and ram bellies the pizzle pieces should be carefully removed and placed in boxes or baskets, to eventually find their class in the stained pieces. Where time permits and it is thought worth while by the classer all belly wool should be skirted, the skirts removed going to the stained pieces.

Locks consist of two sorts. Table locks are those which fall through the rungs of the tables used for skirting and rolling. Board locks consist of the sweepings from the board. In these latter are generally many stained pieces, and these should be carefully taken out and conveyed to their proper places. In most cases the board locks remaining go with the table locks.

### Lambs' Wool.

Lambs' wool should be separately treated. The wool tables are specially prepared for this work by placing sheets on same with the idea of preventing any of the wool falling through. Generally speaking, the wool is picked up between two boards joined loosely together. If the lambs are anything like even in age it will be found that two classes are sufficient. The one class consists mainly of the body wool containing the longest and brightest wools. The second class is made up of that wool rejected.

With a large flock of lambs, and where the drop has been uneven, the ages of the lambs may make another class necessary.

### Pressing the Clip.

Woolpressing is an important item in the general get-up of a clip. The fleece wool should be removed from the bins with as little tearing about as possible. It is not wise to press high-class fleece wools too heavily, but the bale must weigh over 200 lb.

A nice weight for good fleece wools would be anything between 250 and 300 lb.

It should be the endeavour of the classer to see that all bales are as even in size as practicable. This facilitates loading, and is another point in the general get-up of the clip. Neat and careful branding also comes under this heading. The brand should indicate the station and station brand, if desired, the quality of the wool, the sex from which same was derived, and the number. Some selling agents like the brand on the bottom of the bale as well as the side, but this is optional. Correct weighing is important, and to save mistakes it is preferable to weigh all bales immediately they leave the press. Full particulars should be entered in the rough shed book, and at the completion of work for the day copied into the station register. The correct and up-to-date keeping of the register greatly helps the classer in the matter of his periodical reports to the selling agent for the station. The completion of each flock is a handy time for such report, and every endeavour should be made to see that such report arrives at the selling centre before the wool is received into store, thus facilitating the work of the broker.

### Unjustifiable Complaints of Faulty Classing.

There has been much newspaper talk lately about faulty classing. There is no doubt that in some cases there is cause for complaint. A visit to the wool stores when the wool is on exhibition before the sales will produce evidence that better work could be done in the cases referred to. However, the complaints have gone too far, and it is ridiculous to suppose that Australian wool in general, or Queensland wool in particular, compares unfavourably in the classing with any other wool in the world. That there is room for improvement in some cases is undoubted, but taken by and large the Australian clip is pre-eminently the best prepared for market in the whole industry.

To a great extent faulty classing, where it exists, is due to the generally depressed prices. Some owners have made the mistake of thinking that any preparation will do whilst prices are so low. This is an obvious error. Now, particularly, is the time when every penny should be striven for, and scientific classing is essential to achieve maximum financial results.

A good classer is always worth very much more to the owner than his actual wages. Therefore, employ only the best in this capacity.

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## FARM PRODUCE AGENTS ACTS.

A Proclamation has been issued under the Farm Produce Agents Acts, bringing into force the Amendment Act passed last Session.

Regulations under the abovementioned Acts have also been approved, and these embody the Regulations originally in existence, together with additional ones giving effect to the provisions of the amending Act of 1932.

A Regulation has also been inserted, providing that where a farm produce agent has made to a purchaser of bananas sold by such agent, any allowance, whether for short counts, breakages, or immature fruit, he shall clearly show the amount of the allowance and the reason therefor on the account sales rendered by him.

The new Regulations prescribe the Form of Application for a farm produce agent's license, and fix the amount of the bond or security to be given when applying for a license.

# In Memoriam.

## HENRY WILLIAM MOBSBY, F.R.G.S., F.R.S.A.

THE death of Henry William Mobsby, formerly Artist and Photographer in the Department of Agriculture and Stock, at his home at Indooroopilly on Sunday, 9th April, is recorded with very deep regret. He was in his seventy-third year when the end came after but a brief hour's illness.

A native of Brighton, England, the late Mr. Mobsby received his early education at Hampton Place High School in his home city. He studied art and design at the School of Arts, Brighton, and decorative art under the late A. G. Greysmith, of Brighton and London. A subsequent course in chemistry was followed by a general commercial training. In company with the late W. Jenner, the well-known artist, and his family—Mrs. Mobsby was the eldest daughter of Mr. Jenner—he came to Queensland in 1883 and settled in Brisbane. For some years he taught decorative art at the Central Technical College. In 1897 he was appointed Government Artist and Photographer and was attached to the Department of Agriculture and Stock.

For many years his photographic work was a distinctive feature of this journal, as well as other Government publications. As an exhibition designer and scenic photographer he achieved an Australian reputation, besides becoming well known overseas through his association with Commonwealth displays of primary and other products in Great Britain and other countries. In successive years he

designed and helped in the organisation of Queensland exhibits for the great annual shows in the southern capitals. At the Royal National Exhibition in Brisbane each year his work in court design and layout invariably won high commendation. In 1908-9 Mr. Mobsby designed the Queensland Court at the Franco-British Exhibition, and travelled as State representative to London with the late J. M. Campbell to supervise the construction of the layout, design trophies, and formulate a colour scheme.

While in England he exhibited Queensland products at Newcastle, Lincolnshire, and Gloucestershire; also at Aberdeen in Scotland and Dublin in Ireland. When Sir H. Tozer was Agent-General he transposed Gattis Restaurant, in the Strand, to the present Agency-General, supervising fitting up, furnishing, and laying out the first display of Queensland products in London.

In 1915 Mr. Mobsby designed and supervised Queensland's Court at the Panama-Pacific Exposition at San Francisco, and was afterwards appointed Acting Commissioner in Charge by the Queensland Government. He was also appointed by the authorities of the Panama-Pacific International Exposition to act on the jury of awards in the wine section, for which he was awarded a medal for special services. While in America Mr. Mobsby gained a diploma and medal for photography, also a certificate of efficiency in motion picture work.

After assisting in the Australian Natives' Association Exhibitions at Melbourne and the Peace Exhibition at Adelaide, Mr. Mobsby was in 1924 appointed by the Government to the Wembley Commission as State organiser for the Exhibition at Wembley, England. He then went to London by appointment of the Federal Government as display officer at Wembley.

In intervals between exhibitions Mr. Mobsby visited all parts of the State as official photographer, obtaining pictures of the industries associated with his Department, also scenic views which have been used for technical and other publications and lectures all over the world; as well as supplying the Tourist Bureau with pictures for advertising Queensland's productive wealth and scenery, also Departmental record and specimen work in animal and plant pathology by ordinary and micro-photography.

1925-26 Mr. Mobsby was appointed by the Government to organise and design the Queensland Court at the New Zealand and South Seas Exhibition at Dunedin, New Zealand, and afterwards supervised its construction. He also acted as the Queensland Government representative in charge during the currency of the Exhibition.

The late Mr. Mobsby was a Fellow of the Royal Geographical Society and a Fellow of the Royal Society of Artists. In his art he also held a Senior Diploma of the Chamber of Commerce, London; Senior Diploma, City and Guilds, London; Senior Diploma, Cripplegate Institute, London (for theoretical and practical photography); and was a medallist in a world's photographic competition. He was for many years honorary lanternist to the Royal Geographical Society of Queensland. On occasions he was associated with the visits to Queensland of high dignitaries, among whom were the Prince of Wales and the Duke and Duchess of York.

The late Mr. Mobsby was endowed with a personality that attracted friendship wherever he went, and in the course of his travels in other parts of the Commonwealth and abroad he sought every possible opportunity of giving appropriate publicity to the great natural advantages and resources of Queensland by means of picture, pen, and the lecture platform. He was also an ardent seeker after information of advantage to Queensland in the extension of its commercial activities, both interstate and overseas. He was personally instrumental in securing many valuable settlers for Queensland, and generally he gave of his best to the State in his long career of useful public service.

In the presence of members of his family, many old colleagues in the Public Service, and a large gathering of other representative citizens, the late Mr. Mobsby was laid to rest on Monday, 10th April, in the Toowong Cemetery on the brow of a high knoll overlooking the winding river and the city of hills he loved so well. At the funeral Mr. Sydney S. Hooper, of the Department of Agriculture and Stock, represented His Excellency the Lieutenant-Governor (Sir James Blair, Kt.); the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) was represented by Messrs. E. Graham and R. Wilson, Under Secretary and Assistant Under Secretary, respectively. Expressions of sympathy were received by the bereaved relatives from many parts of the Commonwealth, and also from New Zealand.

## PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of Australian Illawarra Shorthorn Society, Jersey Cattle Society, and Ayrshire Cattle Society, production charts for which were completed during the month of March, 1933 (273 days period unless otherwise stated).

| Name of Cow. | Owner. | Milk Production. | Butter Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| AUSTRALIAN ILLAWARRA SHORTHORNS. | | | | |
| MATURE COWS (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| Kilbirnie Ethel III. | Macfarlane Bros., Radford | 14,176·75 | 628·843 | Mowbray of Darbalara |
| Kilbirnie Violo V. | ditto | 13,807·5 | 549·893 | ditto |
| Westbrook Violet 8th | C. O Sullivan, Greenmount | 11,079·07 | 458·443 | Sheik of Upton |
| Laura of Happy Valley | R. R. Radel, Coalstoun Lakes | 8,246·3 | 377·223 | Molly's Hero of Glenthorn |
| Jean 2nd of Euroa | H. T. Lindenmayer, Binjour | 9,261·4 | 370·098 | Dandy of Homelea |
| SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB. | | | | |
| Ursula of Cedar Grove (251 days) | W. J. Freeman, Rosewood | 10,210 | 483·126 | Mabel 2nd Victor of Coral Grove |
| Favourite 3rd of Morden | R. Mears, Toogoolawah | 11,259·35 | 449·828 | George of Nestles |
| Gentle Lady of Coral Brae | W. J. Freeman, Rosewood | 8,747·5 | 348·309 | Fussy's Charmer |
| SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | | |
| Lorna of Greenfields | S. Henry, Goomboorian | 12,552·25 | 423·412 | Darcy of Springdale |
| JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | | |
| Princess of Trevlac | W. J. Freeman, Rosewood | 9,088 | 337·586 | Butter Boy |
| SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | | |
| Cosey Camp Nanny 14th | C. O Sullivan, Greenmount | 7,939·5 | 363·344 | Handsome's Beau of Cosey Camp |
| Happy Valley Lovely 2nd | R. R. Radel, Coalstoun Lakes | 5,535 | 251·55 | Molly's Hero of Glenthorn |

| | | | | |
|---|---|---|---|---|
| **JERSEY.** | | | | |
| MATURE COW (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| Trecarne Rose II. | D. R. Hutton, Cunningham | 8,170·25 | 403·939 | Oxford Palatines Sultan |
| SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | | |
| Pineview Jewel | J. Hunter and Sons, Borallon | 6,593·46 | 431·329 | Oxford Buttercup Noble |
| Rosevale Pet Fox | H. T. Rowe, Kenilworth | 6,196·05 | 331·229 | Prince Victor of Banyule |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| Creamlass of Rosedale | Wakefield Brothers, Atherton | 5,149·9 | 293·299 | Carnation Lad |
| Glenview Twylight | F. P. Fowler and Sons, Coalstoun Lakes | 4,108·35 | 259·203 | Carlyle Larkspur 2nd Empire |
| **AYRSHIRE.** | | | | |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| C. F. Jessie | J. C. Mann, Yarranlea | 6,934·93 | 256·966 | Longlands Roland |

# Answers to Correspondents.

**Cape Cotton.**

P.P.A. (Lamington)—

The specimen is *Gomphocarpus fructicosus,* a native of South Africa, now a common naturalised weed in Queensland and New South Wales. It is commonly known as Cape Cotton or Balloon Cotton. It is quite an ornamental plant and is sometimes seen in gardens, but it can become a great pest. We have seen farms on the near north coast almost smothered with it. The plant belongs to a dangerous family, the *Asclepiadaceæ,* and although stock rarely touch it, we have little doubt that the plant is poisonous.

**Thorn Apple.**

J. H. McC. (Hughenden)—

The specimen forwarded is *Datura metel,* a species of Thorn Apple, a native of tropical America, but now naturalised in many warm countries. It is much less abundant in Queensland than the allied *D. stramonium.* We have no particular knowledge regarding the properties, but should say that there is little doubt that, like other members of the genus, it would be decidedly poisonous.

## BUTTER BOARD.

### CONSTITUTION AMENDED.

AN Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts amending the constitution of the Butter Board in certain particulars. The Order provides for the rescission of certain clauses in the Order in Council constituting the Board and for the substitution of new ones therefor. A new clause provides that the Board shall consist of six representatives and the Director of Marketing, and that the existing Board members shall continue to hold office.

At present the Board members are elected from six divisions arranged according to factories—that is, the supplier votes for the division in which is included the factory to which he sends his cream.

Another clause will now provide that at future elections of growers' representatives the State shall be deemed to be divided into six geographical divisions, consisting of Northern, Central, South-Western, Southern, North Coast, and South Coast Divisions.

The present constitution provides that the electors shall be—

(*a*) The individual suppliers to the various factories;

(*b*) The factories.

The amended clause provides that the voters in an election or referendum shall be—

(*a*) Factories holding a license to manufacture;

(*b*) Cream suppliers.

Every butter factory shall be entitled to one vote, and every cream supplier to one vote in the division in which the factory is situated. In the event of a cream supplier having supplied cream to two or more factories in different divisions, he shall elect in which division he shall exercise his vote, and give notice of such election to the Returning Officer three days before the date of the election or referendum.

It is further provided that, for purposes other than a referendum or election, the persons who shall be deemed to be growers of the commodity shall be those who produce the commodity—that is, the factories only.

In the present constitution, the Board is empowered to make levies upon butter factories, and an amendment empowers the Board to make levies upon such companies, associations, firms, and persons as are necessary.

# General Notes.

## INEXPENSIVE FARM PAINTS AND LIMEWASHES.

Farmers who wish to paint portions of their own premises but are not certain about the method of mixing the paint may find the following information useful:—

### Water Paint Recipes.

One of the most enduring, preservative, handsome, and inexpensive paints for outhouses and for rough structures that it is possible to prepare is a paint that costs little more than whitewash, unless the skim milk used has a special value. The following is the recipe:—

Stir into one gallon of whole milk, skim milk, or even sour milk or buttermilk, about 3 lb. of Portland cement. Add to this Venetian red or any other dry colouring pigment to produce any tint desired. The milk will hold the pigment or paint powder in suspension, but the cement, being very heavy, will sink to the bottom, so that it is necessary to keep the mixture well stirred with a clean flat stick. There are only two drawbacks to this paint; the one is that it has to be stirred frequently and nthe other is that it eeds to be made afresh for each day's work. Six hours after painting this composition can neither be rubbed off nor washed off, unless special and extraordinary means are taken to that end. In America there are buildings twenty years old, the wood of which has been well preserved and the surface of which is still clean and uniform in colour. Whole milk is better than skim milk, because there is more oil in it, and this is the constituent that sets the cement.

### When Milk is Scarce.

Another good whitewash recipe for use where milk is scarce or expensive is the following:—

Take 6 lb. of quicklime and sprinkle on this by degrees about a gallon of water; when it becomes hot and the quicklime swells and cracks sprinkle more water. A little later pour on 4 or 5 gallons of fresh water and mix the whole with a stick. Then take about 1 lb. of alum, break it into small pieces and melt it over a fire with a little water. The alum makes the whitewash stick well to the wood so that it does not come off on one's clothes or hands. In the absence of alum ordinary cooking salt can be used, but alum is preferable. This whitewash can be applied quickly with a broad whitewash brush.

### Clean, Bright Whitewash.

A clean, bright whitewash that will not wash off an outside wall with rain is made up as follows:—

Twenty-eight lb. of unslaked lime, 14 lb. of salt, 3 lb. ground rice, ½ lb. powdered whiting, 1 lb. pipeclay, 5 gallons of hot water. Slake the lime with warm water and keep it covered during the process to keep in the steam. Strain the liquid through a fine sieve. Add the salt dissolved in warm water. Boil the rice to a thin paste with water and stir it in boiling hot. Then add the whiting, the clay dissolved in water, and also 5 gallons of hot water. It must then be heated again and applied hot.

### For Indoor Work.

A whitewash that is reliable and particularly suitable for indoor work is made as follows:—

Make a paste of 50 lb. of hydrated lime in boiling water, or about 5 lb. of quicklime may be slaked in 7½ gallons of water, keeping the vessel well covered and stirring occasionally. To this is added about 10 lb. of common salt dissolved in hot water, 3 lb. of rice flour boiled to a thin paste, which should be stirred in while hot, ½ lb. Spanish whiting, and 1lb. of glue thoroughly dissolved in boiling water. Mix well in the order mentioned above and allow the mixture to stand several days before it is applied. It should be put on with a brush or spray as hot as possible.—"Farmer and Settler."

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### Staff Changes and Appointments.

Constable V. G. W. Tuckey, Walkerston, has been appointed also an Inspector under the Slaughtering Act.

Acting Sergeant G. Beale, Windorah, has been appointed also an Inspector under and for the purposes of the Brands Acts.

Mr. K. V. Henderson, Field Assistant, Cotton Section, Department of Agriculture and Stock, has been appointed also an Inspector under the Diseases in Plants Acts at Monto.

### Levies on Apples and Grapes.

Regulations have been issued under the Fruit Marketing Organisation Acts empowering the Committee of Direction of Fruit Marketing to make levies on growers of apples and grapes in the Stanthorpe district. The district referred to comprises the area within a radius of 40 miles from Wallangarra, and containing the railway stations of Wallangarra to Dalveen, both inclusive, and Amiens to Fleurbaix, both inclusive. The levies will operate for twelve months from the 1st February, 1933.

In the case of apples, the levy is at the rate of 10s. per ton (40 bushel cases or 80 half-bushel cases to be computed as a ton, and other containers at actual weight) or proportionately for each fraction of a ton railed from any of the abovementioned stations, or marketed otherwise. A minimum of twopence will be payable in respect of any consignment. The levy is not payable on consignments to the C.O.D. of apples in cases for export, or factory apples railed in bags. The levy is payable to the Railway Commissioner on behalf of the C.O.D.

The sums raised by the levy will be expended in payment of costs attached to the collection of the levy, and the balance shall form part of the Apple Stabilisation Scheme Fund for the benefit of the Stanthorpe district growers.

Regarding the grape levy, this is at the rate of 6s. 8d. per ton (80 half-bushel cases computed as 1 ton), and a proportionate part of such amount for each fraction of a ton railed from the stations in the area described. A minimum levy of 1d. is imposed. No levy will be payable on grapes in cases for export if consigned to the C.O.D., Brisbane. The levy is payable to the Railway Commissioner on behalf of the C.O.D.

The C.O.D. will advertise all particulars of the levies.

The sums raised by the grape levy will be expended, firstly, in payment of expenses, and the balance shall form part of the Grape Export Scheme Fund for the benefit of the growers concerned.

### Removal of Grape Plants within the Brisbane Area Prohibited.

An outbreak of grape phylloxera has been reported in the Pinkenba district, and in order to take steps to cope with the pest, a Proclamation under the Diseases in Plants Acts has been issued, declaring the area of the City of Brisbane as a quarantine area for the purposes of the Acts, and also prohibiting the removal from any nursery, orchard, or place within the boundaries of such area, of all plants of the genus Vitis, with the exception of the fruit.

### The Sheep Blowfly Problem.

It is estimated that in a year when sheep blowfly is bad upwards of £4,000,000 is lost by Australia as a result of infestation, and it may safely be said that there is no subject on which sheepowners are more urgently in need of authoritative information and advice. There should be a wide demand, therefore, for the joint report just issued by the Council for Scientific and Industrial Research and the New South Wales Department of Agriculture. Both have investigated different phases of the blowfly problem, and the report represents the efforts of a committee established to co-ordinate the work of the two bodies and to advise generally in regard to the initiation of investigations into other aspects of the main problem. It summarises and discusses in popular terms all the known methods of prevention and treatment of fly strike, and is the most significant and comprehensive contribution on this subject to date.

The report comprises 136 pages of subject matter, together with a number of text figures of larvæ, traps, &c., a number of photographs of interest and a coloured frontispiece showing each individual species of blowfly associated with strike. By reference to this frontispiece and to the accompanying descriptions, it will be possible for anyone to determine the nature and importance of any blowfly.

The various sections of the report deal with such matters as primary, secondary, and tertiary flies, factors influencing fly abundance, the susceptibility of individual sheep, crutching, jetting, swabbing, dipping, dressings, breeding to reduce susceptibility, fold removal operation, biological control, trapping, and carcase treatment, as well as a number of other matters of importance in the control of the pest.

The publication is being issued as Science Bulletin No. 40 of the Department and Pamphlet No. 37 of the Council. Copies, price 1s. 6d., post free, are available on application to the Council of Scientific and Industrial Research, 314 Albert street, East Melbourne.

# Rural Topics.

### Combating the Cattle Tick.

Queensland cattlemen will be interested in the subjoined cutting from a recent issue of the "Kansas City Times" (U.S.A.):—

"Splenetic or tick fever in cattle is practically a thing of the past. In fact, ticky cattle have not been even a minor market factor here since 1927, and not an important factor since before the war.

"Of the area originally quarantined, 88 per cent. will have been freed by systematic eradication under the supervision of the Department of Agriculture when the most recent federal order becomes effective—5th December. This order will remove from quarantine 20,290 square miles in Arkansas, Florida, and Texas.

"This release of territory in Arkansas makes it the twelfth State to gain freedom from the quarantine embargo. The States previously released were—Alabama, California, Georgia, Kentucky, Mississippi, Missouri, North Carolina, South Carolina, Oklahoma, Tennessee, and Virginia. After 5th December the area remaining under quarantine will be confined to parts of Florida, Louisiana, Texas, and Puerto Rico."

### The Farm Home—Goat's Milk as Food.

Goat's milk can be used wherever cow's milk can; it is in every way as suitable an article of diet as cow's milk. Moreover, goats never suffer from tuberculosis, they are cheaper to buy than cows are, and they can be kept under many conditions where it is impossible to keep cows.

Goat's milk needs to be kept just as carefully from contamination by harmful germs as cow's milk; these germs are generally carried by flies or dust. It therefore needs to be kept *clean, cool,* and *covered.* It should be brought to the boil directly it is received, poured straight into a freshly-scalded jug, cooled down quickly, and kept in the coolest possible place—preferably standing in water in a draught with a saucer resting on a piece of butter muslin covering it. The corners of the muslin should be dipping into the water, thus keeping the milk cool by evaporation. Milk treated in this manner should keep perfectly fresh for at least twelve hours, even in the hottest weather.

### To Cleanse Muddy Water.

Water containing mud in suspension is easily clarified by the addition of certain chemicals that cause the minute particles of silt to collect into larger aggregates that settle to the bottom. These flocculations enclose and carry down with them many micro-organisms, eggs of hydatids, &c., and leave the water bacterially purer.

When cheapness and chemical efficiency are considered, the chemicals suited to the purpose are limited to alum, ferric chloride, lime, and an impure sulphate of aluminium called "alumina ferric." Lime is only included in the above list on account of its cheapness, and though not nearly so effective in its action as any of the others, its use is still practical. The proportion of lime to be used will vary according to circumstances, but is approximately 1 lb. to one to two thousand gallons of water. The best agents for the purpose are ferric chloride and alumina ferric.

Experiments carried out with muddy water in an open waterhole showed that, in one case, water was cleared in one night by the addition of ferric chloride at the rate of 1 lb. to 1,000 gallons of water, while in another, five hours only were needed, though in this case 2 lb. of ferric chloride were used to 1,900 gallons of water.

Alumina ferric has also been found to be very effective when used at the rate of 1 lb. to 3,000 gallons of water. Alum is less effective than ferric chloride, pound for pound, experiments indicating that 2 lb. alum is equivalent to 1 lb. ferric chloride.

Ferric chloride and alumina ferric should be applied by dissolving in water, diluting to the required strength, and then throwing the solution over the surface of the water to be cleansed as evenly as possible. The surface layers of the water should be stirred gently with a long pole.—A. and P. Notes, N.S.W. Dept. Agric.

# The Home and the Garden.

## TOMATO SEED SELECTION.

In selecting tomatoes from which seed is to be saved, only that from the best yielding plants which conform strictly to the characteristics of the variety, both as regards type of vine and type of fruit, should be chosen. Several fruit should be cut open to be sure of the quality. A plant should be chosen that produces a large number of average size tomatoes rather than a plant with two or three large fruits and a number of small ones. Care should be taken to see that the plant is free from disease, as several tomato diseases are transmitted by the seeds.

The best method of separating tomato seed from the surrounding pulp is as follows:—Cut the fruit in halves and scoop the contents into a bucket, and when the latter is about half full, fill up with water. Stand the bucket aside and allow the contents to ferment, which will take from two to six days, according to the warmth of the weather. A froth forms on top of the water when fermentation is sufficiently advanced. Wash the contents of the bucket on a fine sieve or a layer of hessian and the pulp will come right away from the seed, which must be spread out in a thin layer to dry. Rapid drying is important to prevent moulding. When dry, rub the seed in the hands to separate the individual seeds. Seed harvested in this manner has averaged 94 per cent. germination.

As already indicated, selection from a plant which is free from disease is important, but as a further precaution the seeds should be dipped for ten minutes in a solution of mercuric chloride, 1 part in 1,000 parts of water, before planting. Proper precautions must be taken with mercuric chloride where there are children or animals, as it is highly poisonous if taken internally.

## THE FARM VEGETABLE GARDEN.

The question of drainage should be considered in relation to all classes of soil, but especially in relation to those that are at all heavy. Neglect to make the necessary provision on such soils explains many failures to get good results from them during the winter months. Now is the time to think of the question of treatment.

Briefly, the objects of drainage are (1) to enable as much water as possible to percolate through the soil, and (2) to prevent the lodgment and stagnation of water on the soil surface by enabling excess quantities of water to be carried away with ease. It is especially necessary, of course, to drain clay soils. If water is allowed to remain on these for long they tend to "puddle," but if the water is drained away the soil does not become so compacted, retaining, instead, a more friable (crumbly) and porous condition.

Drainage may be of two kinds—surface or underground; the latter is the more effective, but it entails more labour and expense. A simple surface drainage scheme consists of shallow trenches running between plot and pathway, and connected up to an outlet at a suitable point. A modified form of surface drainage is expressed in a system of raised beds. Where some form of drainage is necessary, and the installation of the underground system is impossible, either of these methods is to be commended.

Underground drainage necessitates a considerable amount of trench digging. On what plan it is advisable to set out the drains will depend upon the size and contour of the area. In some cases a herring-bone design may be applicable, the main trench forming the backbone, so to speak, and running through the lowest portion of the land and the smaller contributory trenches spreading upwards from this. In other cases it may only be necessary to feed the main trench from one side, while in others again main trenches may best be laid at the edges of the area and fed from the centre. These trenches may then be partially filled with broken stones, and the surface of the filling protected with a layer of tin or brushwood, so that the earth with which it is subsequently overlaid may not drop through and destroy the porous character of the filling.

A drain provided with this rubble filling is usually the most convenient to make, and is quite effective; but a roughly-built conduit or channel may take the place of the broken stones, if desired. This may be made of flat stones or bricks, or (failing either of these) of boards. Only the sides and top need be formed of these materials, the trench floor serving for the bottom. The stones or bricks, or

whatever is used, should only be loosely laid together, so that water may fall into the trench through them and be carried off. In country gardens, where saplings are easily available, these may be used effectively in the bottom of the trench (say a foot deep), covered by a 6-inch layer of brushwood.

The depth at which the drain should lie will depend upon the class of soil, but, needless to say, it should be sufficiently deep to allow of cultivation above it. If there is difficulty in arranging this the scheme should be so adjusted that the drain runs underneath the garden pathways, and not under the beds proper; 2 ft. 6 in. to 3 ft. is usually a satisfactory depth at which to lay a drain in the ordinary household plot.

There is little necessity for drainage on sandy soils, but gardeners working on land of a heavier character should set to work now to repair any deficiency in this direction. If the contour of the plot is regular it is not necessary to do the work all at once. As a section of the plot becomes vacant opportunity may be taken to carry out drainage work on it prior to preparing it for another planting. Then, when each section of the garden has been dealt with, the scheme can be connected up.—A. and P. Notes, N.S.W. Department of Agriculture.

## KITCHEN GARDEN.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

## A REMINDER TO ONION GROWERS.

Onion seed growers should, by this, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

# Farm Notes for June.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of

early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

# Orchard Notes for June.

## THE COASTAL DISTRICTS.

THE remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed 'round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and, unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

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## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit-fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn-out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now where the land is ready and the trees are to hand, as early-planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyard ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress, otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as, if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

## AGRICULTURE ON THE AIR.

### Radio Lectures on Rural Subjects.

ARRANGEMENTS have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 4th July, a fifteen-minutes talk, commencing at 7 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures arranged for July and August, 1933:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 4th July, 1933—"The Boy Employment Problem." J. F. Reid, Editor of Publications.

Thursday, 6th July, 1933—"Diseases of the Flower Garden." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 11th July, 1933—"Maize Production on the Atherton Tableland." O. L. Hassell, Instructor in Agriculture, Mareeba.

Thursday, 13th July, 1933—"Diseases of the Vegetable Garden." L. F. Mandelson, B.Sc. (Agr.), Assistant Plant Pathologist.

Tuesday, 18th July, 1933—"Tobacco Leaf Qualities." A. Hamilton, Instructor in Agriculture, Dimboola.

Thursday, 20th July, 1933—"Importance of Sanitation in Chicken Rearing." P. Rumball, Poultry Expert.

Tuesday, 25th July, 1933—"Breeding and Marketing Stud Pigs." E. J. Shelton, Senior Instructor in Pig Raising.

Thursday, 27th July, 1933—"Banana Diseases." J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 1st August, 1933—"The Feeding of Chickens." J. J. McLachlan, Poultry Inspector.

Thursday, 3rd August, 1933—"Phylloxera and other Pests of the Grape Vine." Robert Veitch, B.Sc., F.E.S., Chief Entomologist.

Tuesday, 8th August, 1933—"Household Pests." J. A. Weddell, Assistant Entomologist.

Thurdsay, 10th August, 1933—"The Farmer and his Market." J. F. Reid, Editor of Publications.

Tuesday, 15th August, 1933—"Native Grasses." C. T. White, Government Botanist.

Thursday, 17th August, 1933—"A Review of the Dairying Industry. Season 1932-1933." C. McGrath, Dairy Expert.

Tuesday, 22nd August, 1933—"External Parasites and their Effect upon Chickens." P. Rumball, Poultry Expert.

Thursday, 24th August, 1933—"The Marketing of Cockerels." J. J. McLachlan, Poultry Inspector.

Tuesday, 29th August, 1933—"Lucerne." W. Nixon-Smith, B.Sc. (Agr.), Field Assistant, Townsville.

Thursday, 31st August, 1933—"Accommodation for the Pig." L. A. Downey, Instructor in Pig Raising.

# CLIMATOLOGICAL TABLE—MARCH, 1933.

Compiled from Telegraphic Reports.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. Means. Max. | Shade Temperature. Means. Min. | Shade Temperature. Extremes. Max. | Date. | Min. | Date. | Rainfall. Total. | Rainfall. Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| *Coastal.* | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| Cooktown .. .. | 29·82 | 87 | 75 | 91 | 31 | 72 | 19, 21, 28, 30 | 876 | 13 |
| Herberton .. .. | .. | 83 | 63 | 90 | 13 | 57 | 6,12,14, 28 | 128 | 6 |
| Rockhampton .. .. | 29·86 | 93 | 71 | 100 | 13 | 67 | 2 | 11 | 3 |
| Brisbane .. .. | 29·93 | 85 | 68 | 97 | 18 | 61 | 23 | 55 | 6 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. | 29·89 | 90 | 63 | 101 | 19 | 57 | 23, 31 | 5 | 3 |
| Stanthorpe .. .. | .. | 83 | 56 | 97 | 18, 19 | 41 | 23 | 85 | 3 |
| Toowoomba .. .. | .. | 82 | 60 | 95 | 18, 19 | 54 | 31 | 27 | 4 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·78 | | 70 | 99 | 12,14,15 17,25,28 | 62 | 18 | 239 | 4 |
| Longreach .. .. | 29·78 | 102 | 76 | 107 | 13, 14, 18, 20 | 70 | 28 | Nil | |
| Mitchell .. .. | 29·86 | 96 | 66 | 105 | 18, 19 | 57 | 22 | 42 | 3 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 29·79 | 94 | 77 | 102 | 13 | 73 | 31 | 239 | 3 |
| Boulia .. .. | 29·79 | 100 | 74 | 108 | 13 | 64 | 31 | 21 | 3 |
| Thargomindah .. .. | 29·83 | 97 | 72 | 107 | 17, 18 | 54 | 22 | 17 | 1 |

# RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of March, in the Agricultural Districts, together with Total Rainfall during March, 1933 and 1932, for Comparison.

| Divisions and Stations. | Average Rainfall. Mar. | Average Rainfall. No. of Years' Records. | Total Rainfall. Mar., 1933. | Total Rainfall. Mar., 1932. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 8·48 | 32 | 2·53 | 6·46 |
| Cairns .. .. | 17·98 | 51 | 12·48 | 20·28 |
| Cardwell .. .. | 15·82 | 61 | 2·87 | 11·14 |
| Cooktown .. .. | 15·14 | 57 | 8·81 | 19·25 |
| Herberton .. .. | 7·65 | 47 | 1·28 | 4·10 |
| Ingham .. .. | 15·76 | 41 | 4·96 | 15·65 |
| Innisfail .. .. | 26·17 | 52 | 10·05 | 22·77 |
| Mossman Mill .. | 17·32 | 20 | 12·23 | 22·83 |
| Townsville .. .. | 7·40 | 62 | 0·33 | 7·04 |
| *Central Coast.* | | | | |
| Ayr .. .. | 6·63 | 46 | 0·13 | 2·65 |
| Bowen .. .. | 5·64 | 62 | 0·24 | 1·69 |
| Charters Towers .. | 3·81 | 51 | 0·02 | 3·20 |
| Mackay .. .. | 11·99 | 62 | 0·88 | 2·58 |
| Proserpine .. .. | 11·95 | 30 | 6·04 | 4·69 |
| St. Lawrence .. | 5·30 | 62 | 0·62 | 0·89 |
| *South Coast.* | | | | |
| Biggenden .. .. | 3·88 | 34 | 0·28 | 0·49 |
| Bundaberg .. .. | 5·12 | 50 | 0·84 | 0·12 |
| Brisbane .. .. | 5·71 | 82 | 0·55 | 1·46 |
| Caboolture .. .. | 7·67 | 46 | 1·85 | 2·39 |
| Childers .. .. | 4·55 | 38 | 0·21 | 1·48 |
| Crohamhurst .. | 11·27 | 40 | 2·00 | 3·06 |
| Esk .. .. | 4·82 | 46 | 0·04 | 0·59 |
| Gayndah .. .. | 3·07 | 62 | 0·00 | 0·11 |
| Gympie .. .. | 6 20 | 63 | 0·33 | 0·77 |
| Kilkivan .. .. | 3·92 | 54 | 0·00 | 0·27 |
| Maryborough .. | 5·94 | 61 | 0·96 | 0·18 |

| Divisions and Stations. | Average Rainfall. mar. | Average Rainfall. No. of Years' Records. | Total Rainfall. Mar., 1933. | Total Rainfall. Mar., 1932 |
|---|---|---|---|---|
| *South Coast—continued—* | In. | | In. | In. |
| Nambour .. .. | 9·27 | 37 | 2·75 | 3·00 |
| Nanango .. .. | 3·45 | 51 | 0·04 | 0·85 |
| Rockhampton .. | 4·48 | 62 | 0·11 | 0 30 |
| Woodford .. .. | 7·94 | 46 | 1·50 | 1·90 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 2·71 | 63 | 0·05 | 0·07 |
| Emu Vale .. .. | 2·40 | 37 | 0·00 | 0·25 |
| Jimbour .. .. | 2·58 | 45 | 0·00 | 0·59 |
| Miles .. .. | 2·69 | 48 | 0·86 | 0·70 |
| Stanthorpe .. | 2·65 | 60 | 0·85 | 0·65 |
| Toowoomba .. | 3·78 | 61 | 0·27 | 0·42 |
| Warwick .. .. | 2·52 | 68 | 0·00 | 0·13 |
| *Maranoa.* | | | | |
| Roma .. .. | 2·61 | 59 | 0·01 | 1·05 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 1·55 | 19 | 0·75 | 0·58 |
| Gatton College .. | 3·17 | 34 | 0·08 | 0·04 |
| Gindie .. .. | 2·62 | 34 | .. | 2·20 |
| Hermitage .. | 2·18 | 27 | .. | 0 07 |
| Kairi .. .. | 7·69 | 19 | 2·55 | 8·21 |
| Mackay Sugar Experiment Station | 10·84 | 36 | 0·96 | 0.76 |

GEORGE E. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

| | May, 1933. | | June, 1933. | | MOONRISE. May, 1933. | MOONRISE. June, 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | a.m. | p.m. |
| 1 | 6·22 | 5·17 | 6·37 | 5·1 | 11·40 | 12·3 |
| | | | | | p.m. | |
| 2 | 6·22 | 5·16 | 6·37 | 5·1 | 12·24 | 12·35 |
| 3 | 6·23 | 5·15 | 6·38 | 5·1 | 1·1 | 1·6 |
| 4 | 6·23 | 5 15 | 6·38 | 5·1 | 1·33 | 1·37 |
| 5 | 6·24 | 5·14 | 6·38 | 5·1 | 2·5 | 2·15 |
| 6 | 6·24 | 5·14 | 6·39 | 5·1 | 2·37 | 2·47 |
| 7 | 6·25 | 5·13 | 6·39 | 5·1 | 3·8 | 3·50 |
| 8 | 6·25 | 5·12 | 6·40 | 5·2 | 3·45 | 4·53 |
| 9 | 6·26 | 5·11 | 6·40 | 5·2 | 4·24 | 6·0 |
| 10 | 6·26 | 5·11 | 6·40 | 5·2 | 5·11 | 7·10 |
| 11 | 6·27 | 5·10 | 6·41 | 5·2 | 6·10 | 8·19 |
| 12 | 6·27 | 5·10 | 6·41 | 5·2 | 7 14 | 9·27 |
| 13 | 6·28 | 5·9 | 6·41 | 5·2 | 8·22 | 10·33 |
| 14 | 6·28 | 5·9 | 6·41 | 5·2 | 9·30 | 11·30 |
| 15 | 6·29 | 5·8 | 6·42 | 5·3 | 10·37 | .. |
| | | | | | | a.m. |
| 16 | 6·29 | 5·7 | 6·42 | 5·3 | 11·41 | 12·25 |
| 17 | 6·30 | 5·7 | 6·42 | 5·3 | .. | 1·19 |
| | | | | | a.m. | |
| 18 | 6·31 | 5·6 | 6·42 | 5·3 | 12·40 | 2·15 |
| 19 | 6·31 | 5·6 | 6·42 | 5·3 | 1·36 | 3·10 |
| 20 | 6·32 | 5·5 | 6·43 | 5·4 | 2·30 | 4·7 |
| 21 | 6·32 | 5·5 | 6·43 | 5·4 | 3·26 | 5·0 |
| 22 | 6·33 | 5·5 | 6·43 | 5·4 | 4·19 | 5·54 |
| 23 | 6·33 | 5·4 | 6·43 | 5·4 | 5·16 | 6·46 |
| 24 | 6·34 | 5·4 | 6·43 | 5·5 | 6·11 | 7·35 |
| 25 | 6·34 | 5·3 | 6·44 | 5·5 | 7·5 | 8·20 |
| 26 | 6·35 | 5·3 | 6·44 | 5·5 | 7·59 | 9 0 |
| 27 | 6·35 | 5·2 | 6·44 | 5·5 | 8·49 | 9·34 |
| 28 | 6·36 | 5·2 | 6·44 | 5·6 | 9·37 | 10·6 |
| 29 | 6·36 | 5·2 | 6·44 | 5·6 | 10·21 | 10·36 |
| 30 | 6·37 | 5·1 | 6·44 | 5·6 | 11·1 | 11·6 |
| 31 | 6·37 | 5·1 | .. | .. | 11·33 | .. |

## Phases of the Moon, Occultations, &c.

3 May ☾ First Quarter 8 39 a.m.
10 ,, ○ Full Moon 8 4 a.m.
16 ,, ☽ Last Quarter 10 50 p.m.
24 ,, ● New Moon 8 7 p.m.

Perigee, 11th May, at 3.42 a.m.
Apogee, 25th May, at 9.12 p.m.

The Moon will be passing from west to east of Jupiter at 9 p.m. on the 5th. Jupiter will then be 2 degrees northward of the Moon and nearly an hour past the meridian.

Jupiter, which had been moving westward, apparently amongst the stars of Leo, for some months, will resume its direct course eastward after the 10th.

Saturn will be occulted by the Moon on the morning of the 16th soon after 6 a.m. To an observer with a telescope or binoculars this will be an interesting occurrence if the sky is clear.

Mars will be passing Neptune at 6 a.m. on the 17th. The apparent distance between them will be about 1½ times the diameter of the Moon.

Very soon after sunset on the 25th the new Moon and Venus may both be detected by keen observers in the afterglow.

Saturn, which has apparently been moving eastward amongst the stars of Capricornus, will become stationary on the 27th; it will then retrace its steps till on 7th August it will reach almost the same position as on 21st March.

Mercury will be occulted by the Sun on the 28th. No observation will be possible on account of the intense brightness of the Sun. It is only occasionally that a direct line from the Earth to Mercury passes through the Sun. The distance of Mercury from the Earth will then be more than 123,000,000 miles.

Mercury rises at 4.27 a.m. on the 1st and at 5.17 a.m. on the 15th.

Venus sets at 5.28 p.m., 11 minutes after the Sun, on the 1st; on the 15th it sets at 5.41 p.m., 33 minutes after the Sun.

Mars rises at 2.8 p.m. and sets at 1.13 a.m. on the 1st; on the 15th it rises at 1.23 p.m. and sets at 12.36 a.m.

Jupiter rises at 2.37 p.m. and sets at 2.5 a.m. on the 1st; on the 15th it rises at 1.41 p.m. and sets at 1.10 a.m.

Saturn rises at 11.56 p.m. and sets at 1.9 p.m. on the 1st; on the 15th it rises at 11.3 p.m. and sets at 12.16 p.m.

During the evening hours, before midnight, the most noticeable planets will be Mars and Jupiter, both apparently in the constellation Leo; but later in the month Venus will again reappear as an evening star, but only for a short time after sunset.

1 June ☾ First Quarter 9 53 p.m.
8 ,, ○ Full Moon 3 5 p.m.
15 ,, ☽ Last Quarter 9 25 a.m.
23 ,, ● New Moon 11 22 a.m.

Perigee, 8th June, at 1.24 p.m.
Apogee, 22nd June, at 12.18 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

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QUEENSLAND AGRICULTURAL JOURNAL

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## Seed Maize for Sale.

### EARLY APPLICATION ADVISED.

Specially propagated and selected seed maize will be available, as usual, for distribution from the Department of Agriculture and Stock for the coming season's sowing. Growers are requested to place their orders immediately in order to avoid disappointment. If necessary, the seed will be held in store until required by the purchaser, when it will be railed on the date indicated by him.

A flat rate of nine shillings (9s.) a bushel is being charged. This price includes carriage to the nearest railway station; but where steamer freight is necessary, this and all other consequential charges must be paid by the purchaser and the total cost added to the remittance.

Applications for seed, with accompanying remittance (exchange added), should be sent to the Under Secretary, Department of Agriculture and Stock, Brisbane. Postal address and name of railway station to which the seed has to be consigned should be clearly stated; also the desired date of despatch from Brisbane.

Full particulars of conditions of sale, prices, and description of varieties will be published in the July issue of the "Queensland Agricultural Journal."

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

JUNE NOTES BY EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

### GRUBS UNDERGROUND.

BY referring to the accompanying plate it will be noted that during this month a few grubs—derived from eggs laid by beetles belonging to secondary broods (which occurred during late December or in January) still linger in the surface soil subsisting on cane butts. By June, however, most of the damage has been done, 80 per cent. or more of the grubs having ceased feeding and gone below to transform to the pupa or chrysalis condition.

The full extent of devastation caused by grey-back cockchafer grubs has now become only too evident, and one is confronted on all sides by demonstration of the economic importance of this formidable pest, which has been universally accorded pre-eminence among the various insects known to attack sugar-cane in Queensland.

#### Behaviour of Grubs while Preparing to Pupate.

Shortly before tunnelling downwards to change into the next life-cycle stage, the mature grub, which by this time has become quite opaque, assumes a brownish-yellow colour.

Having formed a pupal or resting cell and ejected all extraneous earthy matter from its body the entire grub, as it lies in the ground awaiting transformation, is of uniform colour and presents a somewhat shrunken appearance, the body having now lost its characteristic U-shaped form. When this transformation finally takes place its dry-looking yellow skin suddenly splits lengthwise near the head and is gradually pushed or worked off by the reddish-yellow underlying pupa; this is accomplished by certain wriggling movements which are continued until the skin becomes slowly detached and is passed backwards by the pupa to lie as a small crumpled up pellet at one end of the cell.

It should be remembered that grubs of our grey-back beetle usually pupate directly beneath the line of damaged stools, where the ground has remained practically undisturbed for one or more growing seasons. The care exercised by Nature for the preservation of this particular cane-beetle is well shown by the complete isolation of its pupa, which inhabits a specially-prepared subterranean chamber, the smooth puddled walls of which effectually exclude small insect enemies, and while serving to maintain uniform body moisture also prevent possible injury to the pupa by heavy flood rains.

The depth at which pupæ of the grey-back are found to occur may vary from 6 to 15 or more inches, depending largely on the mechanical composition of the soil, its porosity, the degree of moisture present at time of pupation, natural drainage, and the presence or otherwise of aggressive soil-frequenting insect enemies of the grub. The average depth of the cell in light land with a clay or stony subsoil is about 12 inches; while on certain volcanic soils of great uniformity and depth these pupæ have been found 2 feet or more below the surface. On the other hand, they have been collected from sandy loams at depths varying from

4 to 6 inches. When some of the abovementioned agencies chance to combine with favourable climatic conditions, this insect pest experiences a severe natural check, the effects of which are felt for a couple of years or more.

**Subterranean Parasites of Grubs.**

From April to June a varying percentage of mature grey-back grubs is likely to succumb to the attacks of the well known vegetable parasite "Green Muscardine Fungus." When invaded by this parasite the body of a grub, instead of decomposing in the usual manner after death, retains its ordinary shape, and gradually hardening turns at first white and then an olive-green colour. At this stage the body, being filled with the "roots" of the fungus, becomes mummified and can be broken into pieces as though made of dry cheese. The green


PLATE 46.—Grubs of the Grey-back Cane Beetle tunnelling into the ground to transform into the pupal condition. Other grubs still feeding on basal portions of cane sticks.

appearance of these grubs is due to the presence of microscopic chains of spores arranged in prismatic masses incrusting the body, and being in reality the fruit or seed of this parasite. (See illustration.) If wishing to make the best use of such spore-laden grubs, they should be collected by the grower when noticed in plough-furrows, crushed into powder, and thoroughly mixed with about one-thousand times the quantity of moist finely-sifted soil, rich in organic matter. This should be sieved and then placed in a tightly-closed tin canister until used, to keep the soil from becoming too dry. When planting any area of land known to be liable to grub-infestation a little of this spore-laden soil may be sprinkled at intervals of 2 or 3 feet as thinly as possible in the furrows just ahead of the planter.

Another parasite which usually causes heavy mortality during seasons when these grubs chance to occur in great numbers is a species of bacterium. Grubs invaded by this bacterium exhibit black blotches on the sides, especially around the spiracles, which are quickly followed by rotting off of one or more of the joints of the legs. A day or so later the entire body blackens and liquefies internally, quickly decomposing into an evil-smelling mass. Abnormally wet conditions prove highly favourable to development of this bacterial disease, which generally destroys its victim about five days after infection.

PLATE 47.—Grubs of Grey-back Cockchafer killed by Green Muscardine Fungus; showing *mid* and *final* stages of development. (Natural size.)


PLATE 48.

D. A prismatic mass of spores. X 160.

E. Spores germinating, X about 700.

**Influence of Moisture on Depth of Pupae.**

When the period of transition from grub to pupa chances to commence just after heavy rain has fallen (at the end of June or early in July), many of these grubs are induced to pupate unusually near the surface. In such years, therefore, when sufficiently moist conditions are encountered by them at a depth of about 8 inches, pupation in certain classes of land is liable to take place at levels in the soil varying from 7 to 9 inches below the ground. Common-sense control methods can be profitably undertaken during such seasons, and growers are advised in such favourable years to plough up their grub-infested blocks of cane to a depth of from 9 to 12 inches in August or September, and so combine with ordinary farm cultivation the destruction also of thousands of grey-back pupæ.

Similar work when carried out in October in such seasons will unearth and bring into the plough-furrows numerous adult specimens of this cockchafer beetle, which being immature generally succumb to the untimely exposure to the light and hot sunshine. In addition, however, to this control exercised by man, prolonged dry weather may be experienced in such years during July and August, in which case pupæ lying at depths of 6 or 8 inches in light, porous soils are likely to suffer from lack of sufficient moisture. Should drought conditions continue until the middle of December these unfortunately situated pupæ would naturally be the first to perish.

A full description of the pupa will be given in the July notes on this beetle, together with a discussion of the possibilities of its control by means of artificial methods. The downward journey of grubs into the soil in order to construct pupal cells is illustrated in the plate given this month. The small remnant still feeding will follow them a few days later.

# Diseases of Vegetables.*

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

PATHOLOGICAL problems for discussion in this chapter include the following:—Downy mildew, powdery mildew, anthracnose, and wilt of cucurbitaceous plants, i.e., melons, cucumbers, pumpkins, etc. Bacterial black rot, blackleg, and downy mildew of cabbages and cauliflowers also require consideration, and anthracnose of the bean will be discussed.

## Downy Mildew of Cucurbits.

Downy mildew is probably the most serious disease affecting cucurbits in this State. Rock-melons and cucumbers suffer most severely while marrows are also occasionally attacked. In moist warm weather favourable to the spread of the fungus, little more than a week is needed for a field to be practically wiped out.

### SYMPTOMS.

The disease commences first on the older leaves of a vine near the centre of a plant and gradually works out from these along the runners. In its early stages downy mildew shows up as small diffuse and somewhat indistinct greenish-yellow spots. These enlarge until they become delimited by some of the veins of the leaf to more or less definite angular areas of about ⅛ to ¼ inch across. (Plate 49.) The colour of the invaded area turns to a more distinct yellow or light yellowish brown. If the spots are numerous they may coalesce to form larger discoloured areas which give, especially in the case of cucumbers, a yellow appearance to the plant as a whole. The affected portions gradually turn brown and dry out, and the leaf contracts upwards about the main veins giving a characteristic claw-like effect. The wilting of the leaves extends out along the runners, leaving a small number of the younger leaves at the end unaffected or showing only early symptoms.

When once a vine becomes badly affected the development of any fruit present comes to a standstill, nor are any more produced. Sunscald may result from the loss of leaves.

### CAUSE.

The disease is brought about by a fungus parasite (*Pseudoperonospora cubensis*) allied to those fungi producing downy mildew of the grape vine, cabbage, &c. Often there is no external indication of the fungus causing the disease spots, but during moist weather the fruiting stage appears on their under surface as a very delicate whitish down which changes to a light purple brown as the spores mature. When infection is heavy the whole of the under surface of the leaf may have a downy coat of this colour. The fructification consists of delicate conidiophores branched in a somewhat tree-like manner which project two or three together from the stomata. From the tip of each of the branches is produced a thin-walled oval spore which easily becomes detached and blown about, thus serving to disseminate the fungus.

* Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc. Published by the Department of Agriculture and Stock, Brisbane, 1929.

### CONTROL.

The disease may be checked by systematic spraying with Bordeaux mixture. This spray applied at the usual strength is found to cause burning of some cucurbits, and it is therefore advisable to use instead a 3-4-40 formula. Care must be taken that both upper and under surfaces of the leaves are covered.

It will be noted that the disease makes its first appearance on the older leaves towards the centre of the plant. Spraying should therefore commence when the plants are small, in order to prevent infection starting in this region. By this means spread of the disease may be retarded sufficiently to enable the crop to be harvested. Once downy mildew has got a firm hold in well-advanced vines little can be done to save them.

Any diseased material should be burnt, and a field on which a mildewed crop has grown should not be planted again to cucurbits for a year or two.

Some varieties appear to show resistance to downy mildew, but there is not yet available satisfactory data in this connection so far as Queensland is concerned.

## Powdery Mildew of Cucurbits.

Powdery mildew is a disease to which all cucurbit crops are subject, though the cucumber, marrow, and pumpkin probably suffer most. The disease is caused by a fungus (*Oidium erysiphoides*) which is one of the ectoparasitic type, living as it does on the exterior of the host plant. The interlaced mycelial threads, together with the fructification, form diffuse white patches on both the upper and lower surfaces of the leaves. These patches spread and merge into one another until the whole leaf may become covered with a white floury coat. (Plate 50.) The lesions are not of the definite restricted area seen in the case of downy mildew. The affected leaf turns a greenish yellow and then yellow usually over fairly large areas, and finally dries out. As in the case of downy mildew, the older leaves are attacked first, the infection proceeding from the centre out along the runners.

The fructification of the fungus consists of straight unbranched conidiophores developed direct from the surface mycelium. Transverse septa laid down in these cut off successive cells which become constricted off to form thin-walled oval spores. These may remain loosely attached for a time, forming a chain.

### CONTROL.

Owing to the superficial growth habit of the fungus causing this disease, spraying with lime sulphur or dusting with sulphur will provide control. To be effective, both sides of the leaves must be covered.

## Water-melon Anthracnose.

Anthracnose is a disease which may attack water-melons, cucumbers, and rock-melons. The amount of loss sustained depends largely on weather conditions. During a hot dry season the disease may not obtain a firm hold until after the vine has ceased to be productive. In a wet season considerable loss may be experienced through fruit disfigurement and reduction in yield from loss of foliage. The disease is caused by one of the anthracnose group of fungi (*Colletotrichum lagenarium*).

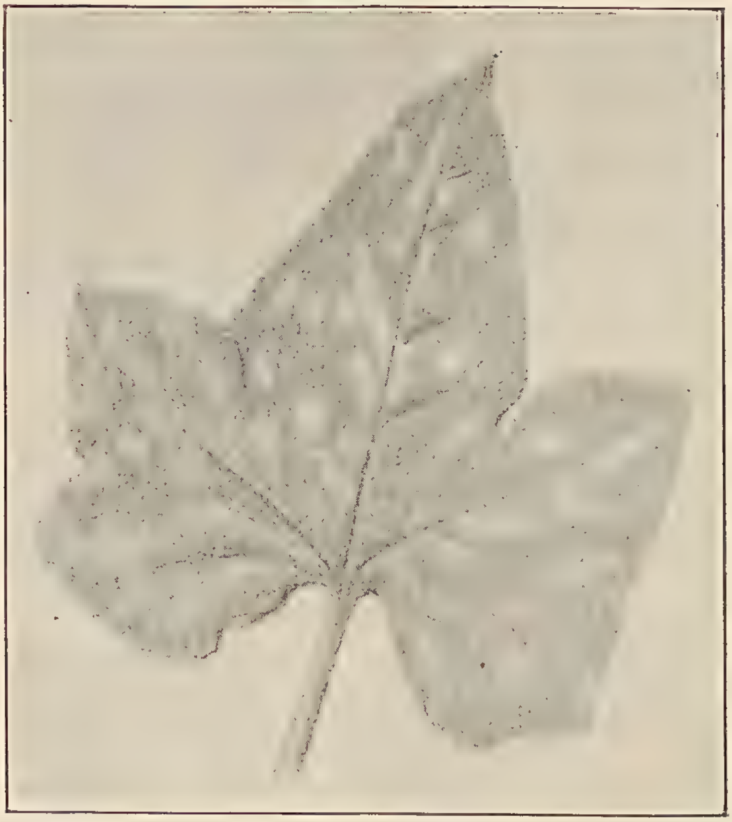

PLATE 49.—CUCUMBER LEAF AFFECTED WITH DOWNY MILDEW.

PLATE 50.—POWDERY MILDEW ON THE MARROW.

### SYMPTOMS.

All parts of the plant may be attacked, the invasion commencing from the centre of a hill and working outwards. The symptoms vary somewhat on the different hosts. In the case of the water-melon there appear on the leaf scattered, sharply defined, dark-brown to almost black spots of a roughly circular outline and of varying size up to nearly ½ inch in diameter. Stem lesions take the form of linear or broadly linear brown and somewhat shrunken patches in the centre of which there frequently appear clusters of light-pink pustules formed by the spore masses of the fungus concerned. The combination of leaf and stem injury results in the withering of the older leaves from the centre of the vine outwards, possibly at the same time exposing developing fruit to sunscald.

On the fruit small light-brown slightly raised spots appear. These enlarge, turn dark brown, and become somewhat sunken. At the base of the depression appear the pink spore masses characteristic of the disease. Infection of young fruit may lead to malformation. On older fruit the anthracnose lesions may be sufficiently numerous to coalesce and form large irregular disfiguring patches. (Plate 52.) Often other organisms are able to invade the fruit through anthracnose spots and set up extensive rot.

On the cucumber the leaf lesions are less conspicuous, owing to their being of a light-brown rather than black colour. The fruit are not so commonly attacked as in the case of the water-melon.

### CONTROL.

1. Infection of a crop often results from the use of a field in which there remains refuse from a diseased crop of the previous year. Cucurbits should therefore not be planted on the same land for two years in succession.

2. The grower should be careful if selecting his own seed to make sure that the fruit used does not bear anthracnose lesions from which spores may chance to contaminate the seed.

3. Spraying cannot be relied on to act as a sure prevention, owing to the difficulty of covering the under surface of all leaves. Bordeaux mixture of 3-4-40 strength if systematically applied will, however, check the disease sufficiently to enable a crop to be taken off. An application should be made as soon as the vines begin to run, and another when the first fruit have formed. Further applications will be necessary if the weather is at all wet especially should the disease makes its appearance in the field.

## Water-melon Wilt.

Water-melon vines will sometimes wilt off suddenly for no apparent reason; the plant may previously appear perfectly healthy. On cutting across the base of the stem of a wilted plant the large water-conducting vessels will be seen to exhibit a yellowish-brown discolouration. This is due to invasion by a fungus (*Fusarium niveum*), a parasite allied to the one causing Fusarium wilt of tomatoes. This fungus can live for long periods on vegetable mould in the soil, and from there will invade

the melon plant per medium of injured roots. The fungus then travels up through the vessels of the stem, causing sufficient damage to these to eventually bring about the wilting of the vine.

Fungi with the same habits sometimes cause trouble of a similar nature in other cucurbitaceous crops.

### CONTROL.

Owing to the soil-frequenting habits of the fungus, little can be done beyond rotating an infested field for several years to crops other than those belonging to the cucurbit family.

## Black Rot of Cabbage and Cauliflower.

Black rot is probably Queensland's commonest cabbage disease. The plant may be attacked at all stages of growth, and when the disease becomes well established heavy loss is the result. The disease is favoured by warm weather, and is therefore most serious on a crop grown during the summer months.

### CAUSE.

Black rot is caused by a bacterial parasite (*Pseudomonas campestris*). This is a minute rod-shaped organism with a single vibratile flagellum developed from one end, by means of which progress through the plant tissue becomes possible. The bacteria enter the plant through the minute water-pores which are to be found situated round the margin of the cabbage leaf. On a cool night small drops of surplus water will be seen exuding from these openings. The bacteria reaching these drops quickly multiply and find their way through the pores into the leaf. The injuries caused by the various leaf-eating insects will also serve as a point of entry.

### SYMPTOMS.

As a result of this method of invasion there is seen, as a first symptom of attack, light-brown areas of dying tissue extending in from the margin of the leaf or surrounding insect wounds. The affected region gradually advances along the direction of the main veins towards the midrib, and the brown invaded tissue dries out to a thin papery consistency. The bacteria travel chiefly within the water-conducting vessels of the veins, which they discolour to such an extent that the latter stand out as black lines over the brown areas. (Plate 53.) Eventually the whole leaf may dry up. The bacteria meanwhile travel down the midrib and leaf-stalk into the main stem of the plant, and from this can invade other parts. In this manner they may pass up the stem into younger leaves, and so produce dark blotches in the white centre of leaves of an apparently sound head. The organisms may multiply in the water-conducting vessels of the stem to such an extent that the normal function of these can no longer be performed, with the result that affected plants are usually markedly stunted.

Although the black rot bacteria only produce a dry rot, they may open the way for the invasion of various soft rot organisms which finally bring about a rapid, foul-smelling, wet rot.

On cutting across the base of an affected leaf or through the crown of the plant, the black ring of bacteria-filled vessels usually stands out plainly, and constitutes for diagnostic purposes perhaps the most characteristic symptom of the disease. (Plate 55.)

PLATE 51.—CABBAGE BLACKLEG.

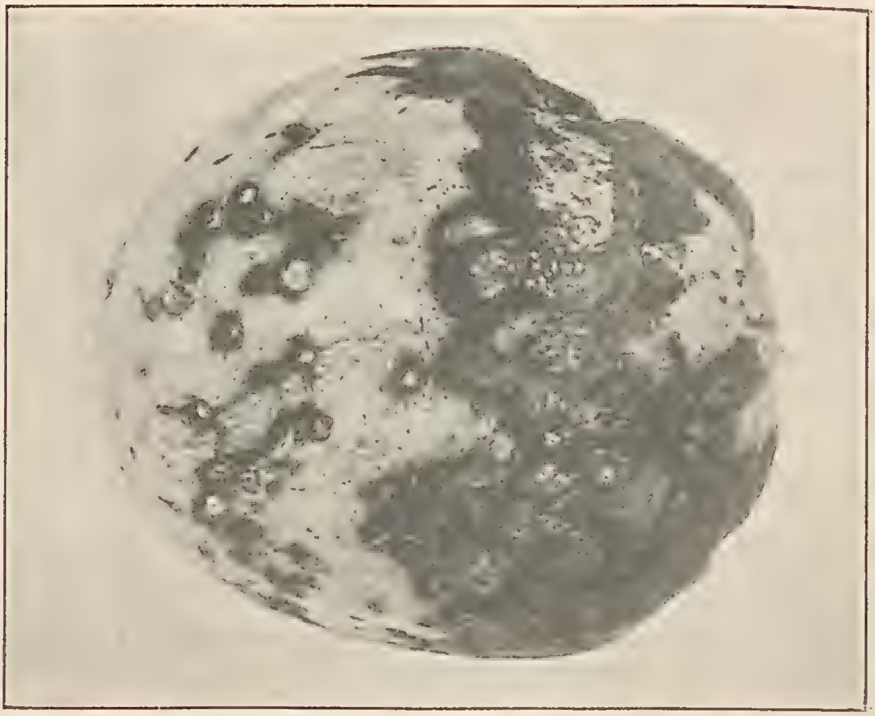

PLATE 52.—WATER-MELON ANTHRACNOSE.

Almost all cruciferous plants are subject to black rot, though the cabbage and cauliflower are the ones seriously affected. In the cauliflower there is a tendency for the affected areas of the leaf to be restricted in extent, and they may eventually dry up and drop out.

### CONTROL.

In this connection it may be pointed out that the bacteria causing black rot may contaminate the seed, where they can remain unaffected by desiccation for many months. They can also live in the soil for a year or two in the absence of a living host. The field and seed-bed can therefore easily become infested by contact with refuse from a diseased crop.

The following control measures should be practised:—

1. Obtain seed from a district in which seed-borne diseases are not known to exist. If the origin is doubtful, the seed should be disinfected by soaking for thirty minutes in a 1 to 1,000 solution of corrosive sublimate. The seed is then rinsed thoroughly in clean water and spread out to dry. Care must be exercised when using corrosive sublimate, as this chemical is a deadly poison.

2. Select a site for the seed-bed some distance removed from land that has previously grown cabbage or other cruciferous crops. Be sure that manure used in the bed is free from any chance of contamination. If a suitable site cannot be obtained the bed should be disinfected as described in the chapter on fungicides and disease control.

3. Practise crop rotation. After producing a cruciferous crop the land should be kept free from cabbage, cauliflower, or related plants for two or if possible three years.

4. Insects may be the cause of an increase of the disease, by creating means of entrance and also by directly carrying the bacteria from plant to plant. These should therefore be kept in check by suitable spraying or dusting.

## Blackleg of Cabbage.

This disease is caused by a fungus (*Phoma lingam*) which, like the black rot organism, may attack the plant at any period of its growth from the seedling stage to maturity. Cabbages and cauliflowers are both liable to serious infection, while the fungus may attack to a less extent other related crops such as turnip, radish, and several cruciferous weeds.

### SYMPTOMS.

The disease commonly appears first in the seed-bed, where its presence is manifested by a stunting and yellowing of the plants, and frequently by damping off. In an affected plant an area of rot appears on the stem below the seed-leaves. This usually becomes sunken and of a dark colour. The fungus may advance rapidly through the tissue until the stem is cinctured and the seedling wilts.

In other cases infection may take place in the bed, but the disease does not develop sufficiently to prevent the seedling from being planted in the field. Here the fungus will develop further and destroy the tissue of the stalk below the leaves, gradually extending its attack down the rootstock. The affected region becomes shrunken and black, giving the

appearance from which the name is derived. (Plate 51.) Later there will appear numerous minute black specks scattered over the affected area. These are the rounded fruiting bodies or pycnidia of the fungus causing the disease, and their appearance serves to distinguish blackleg from other diseases of the cabbage producing somewhat similar symptoms. The root system may be entirely destroyed, leaving only a tapering stump. Sometimes a tuft of lateral roots will be developed above the affected region, and these for a time lend some support to the plant.

The fungus may also attack the leaf-stalks and leaves, forming on the latter irregular light-brown areas speckled over with the black pycnidia. Spores from these leaf lesions may be splashed or blown on to the growing seed-head, and there develop and cause infection of the seed-pods and seeds. Seed contaminated in this way is a frequent cause of the introduction of blackleg into clean areas.

The effect on the plant as a whole is to cause a yellowing and dying of the outside leaves, which shrivel up and remain attached to the stem. (Plate 51.) The diseased plant is usually markedly stunted as compared with healthy individuals, and may eventually wilt off completely during a spell of dry weather.

### CONTROL.

The chief means by which infection of a new crop takes place are—(*a*) By the use of infected seed; (*b*) by sowing in an infected seed-bed; (*c*) by planting in an infected field. Spores may remain capable of germination associated with old diseased cabbage refuse in the soil until this has completely rotted away.

In the matter of the source of primary infection, there is then close correspondence between blackleg and the bacterial disease previously described. As would be expected from this, the control measures for the two diseases are very similar.

1. Obtain seed from a district in which seed-borne disease is not known to exist, or else treat the seed to destroy the fungus with which it may be contaminated. Sterilisation of the seed with corrosive sublimate as for black rot may be practised, but, owing to the fact that the fungus mycelium may actually penetrate the internal tissues of the seed, this method does not always give satisfactory control. A better plan is to adopt a hot-water treatment, in which the seed is immersed for 25 minutes in water held at 122 deg. F. At this temperature the spores and mycelium of the fungus are killed while germination of the seed is scarcely interfered with. The operation necessitates the employment of considerable care to ensure an even temperature.

2. Use only fresh or sterilised soil for the seed-bed, and let this be situated as far as possible from the location of previously diseased plants. Watering the seed-bed by carefully flooding the surface rather than by overhead spraying will help to prevent the distribution of the fungus throughout the bed.

3. Spraying the seedlings with weak Bordeaux mixture (4-4-40), combined if desired with arsenate of lead, will help to keep this and other seed-bed diseases in check.

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Plate 53.—Black Rot of Cabbage.

4. Practise a rotation of crops, allowing at least a three-year interval between plantings of a cabbage, cauliflower, or related crop. The land will be more quickly freed from infectious material if the remains of the diseased crop are carefully removed and burnt and the ground well ploughed.

### Downy Mildew of Cabbage.

Downy mildew is a disease in this country mainly confined to the seed-bed. Growers of cabbage and cauliflower often find it difficult during a wet season to raise sufficient seedlings for their needs, owing to the ravages of this disease.

#### Symptoms.

A white downy growth appears on the under surface of the young leaves, which soon turn a dark colour and shrivel up. (Plate 54.) Finally the whole seedling dies down. The trouble will spread rapidly through a bed leaving few or no healthy plants.

#### Cause.

The disease is due to the attack of a fungus (*Peronospora parasitica*) which is of a similar type to those organisms causing downy mildew of the grape vine, cucumber, &c. The white mildew characteristic of the disease is produced by numerous clusters of fungal fructifications. These consist of short, upright conidiophores which branch in a somewhat arborescent manner at the top, and develop from the tips of the terminal branches delicate, oval, thin-walled spores. The spread of these spores by wind and rain serves to distribute the disease throughout the seed-bed. Another form of spore may be found within the tissue of the plant. This is of a rounded, thick-walled, sexually produced type known as an oospore. This serves as a resting spore, and enables the fungus to live through adverse conditions of environment and infect succeeding crops.

#### Control.

1. The seed-bed should be located on new ground, as is required for the control of other cabbage diseases.

2. Avoid a thick growth by thin sowing in order that air may circulate freely among the plants.

3. Watering should not be excessive, and is best done by flooding the ground rather than by overhead spraying.

4. Cabbage seedlings should be sprayed with Bordeaux mixture of 4-4-40 strength (combined if desired with arsenate of lead) to check the various seed-bed diseases.

### Bean Anthracnose.

Anthracnose has long been recognised as a serious disease of the French bean, and is known to occur in practically all countries in which this crop is grown. Most serious epidemics occur during successive wet seasons, especially if the rain comes during cool weather.

#### Symptoms.

All parts of the plant may be attacked, though the lesions when occurring on the pod are most conspicuous and characteristic. Here the disease first appears as minute brown spots. These enlarge radially

as the fungus producing them advances through the tissue until they are ¼ inch or more in diameter. As the cells of the pod tissue are invaded they die and collapse, and the spot becomes in consequence more or less depressed. The central sunken portion is usually dark-brown almost black in colour, and is surrounded by a margin of lighter brown. Under moist conditions the centre of the spot will be covered with clusters of pinkish pustules representing the fruiting stage of the fungus concerned in the injury. (Plate 56.) The leaves may exhibit brown irregular patches chiefly in connection with the veins of the under surface. Dark-brown cankerous areas are formed on the seedling leaves and lower portions of the stem as a result of seed infection. The spotting on the pod may spread in storage when beans are subjected to long-distance consignment.

### CAUSE.

Bean anthracnose is caused by the attack of a fungus parasite (*Colletotrichum lindemuthianum*). The fruiting bodies of this fungus are very readily produced on the affected areas during moist weather. Mycelial threads become massed together at certain points just below the dead epidermis, forming the bed or stroma characteristic of the anthracnose fungi. From the stroma, short, closely growing, peg-like conidiophores are developed which cut off at their apex single clear oval spores. The production of numbers of these spores finally ruptures the overlying layer of plant tissue. The individual spores are held together in a mass by a mucilaginous secretion, and these form the pinkish coloured pustules mentioned above. A shower of rain will free the spores and transfer them to healthy plants.

When the pods are attacked the fungus is frequently able to penetrate through to the seed, which becomes invaded by the mycelial threads. Seed infested in this manner may be somewhat malformed, and usually bears brown or black patches of varying size and shape. The fungus may remain within the dry seed in a dormant state until the latter is subjected to moist conditions suitable for germination. It will then commence to develop further and soon proceeds to the formation of the fruiting stage. Affected seed is frequently too much injured to permit of germination, but should this take place the spores formed on the primary point of invasion may be washed on to the young growth or base of the stem, causing further lesions which may result in the stunting or death of the young plant.

### EFFECT.

The grower often reckons his loss from anthracnose only on the basis of the amount of discard necessary on account of pod disfigurement. In addition to this there have usually been losses due to poor germination of infected seed, death of affected seedlings, and general reduction in productiveness of diseased plants.

### CONTROL.

1. Anthracnose has received the attention of many workers, and it has been clearly shown that the chief danger of an attack of this disease lies in the use of infected seed. The grower should therefore obtain his seed from a crop in which anthracnose has not appeared. Failing this, a selection should be made of seeds from pods which show no sign of any blemish which might be attributed to the presence of this disease.

PLATE 54.—DOWNY MILDEW ON CABBAGE SEEDLINGS.

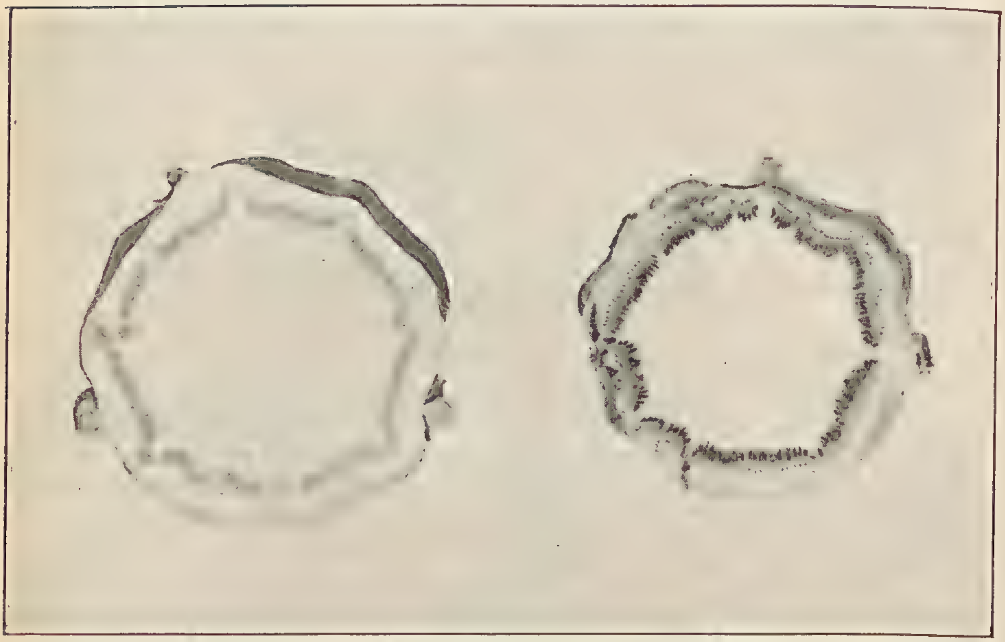

PLATE 55.—Transverse section of the stem of a healthy Cabbage (left), and a Black Rot infected Cabbage (right), to show characteristic blackening of the vascular tissue by the bacteria.

Plate 56.—Bean Anthracnose.

For this purpose a regular grower might well keep a small seed-plot which could be more easily kept free from anthracnose by removal of affected plants and regular spraying. The picking over by hand of seed whose origin is uncertain, removing any showing spots or blemishes, is sometimes practised. While this lessens the number of seedling infections, the method is not sufficiently efficient to act as a substitute for selection in the pod. A simple and trustworthy means of seed sterilisation for this disease has not yet been forthcoming.

2. Do not select for bean-growing land having a low damp situation. Sow the plants as thinly as economically possible, in order to reduce the moist conditions arising from a fall of dew or rain and to lessen the chance of spreading. If beans are to follow on the same land next season, all refuse from a diseased crop should be removed and burnt, as the fungus can pass from one season to the next on such material. If a rotation of crops can be practised so much the better. A bean crop should not be worked when the plants are wet, as spores are then very liable to be carried about the field on clothes, implements, &c.

3. Spraying regularly and thoroughly with Bordeaux mixture of 4-4-40 strength will control the disease. It is, however, doubtful whether in many instances the value of the crop would warrant this procedure. In the case of a small plot grown for seed purposes, spraying may be carried out to advantage.

4. The breeding of resistant varieties would appear to be the most promising means of dealing with this disease. Unfortunately there is as yet no data in this connection so far as Queensland is concerned.

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## QUEENSLAND SHOW DATES, 1933.

Townsville: 11th and 12th July.
Caboolture: 13th and 14th July.
Rosewood: 14th and 15th July.
Nambour: 19th and 20th July.
Charters Towers: 19th and 20th July.
Esk: 21st and 22nd July.
Ingham: 21st and 22nd July.
Atherton: 25th and 26th July.
Cairns: 25th to 27th July.
Maleny: 26th and 27th July.
Pine River: 29th July.
Royal National: 7th to 12th August.
Crow's Nest: 23rd and 24th August.
Home Hill: 1st and 2nd September.
Imbil: 1st and 2nd September.
Enoggera: 2nd September.
Innisfail: 8th and 9th September.
Mary Valley: 1st and 2nd September.
Kenilworth: 30th September.
Southport: 6th October.
Nerang: 13th October.
Kilkivan: 22nd and 23rd May.
Roma: 23rd to 25th May.
Gympie: 24th and 25th May; Campdraft, 27th May.
Biggenden Sports: 26th May.
Toogoolawah: 26th and 27th May.
Kalbar: 27th May.
Maryborough: 30th and 31st May, and 1st June.
Callide Valley: 2nd June.
Marburg: 3rd to 5th June.
Childers: 5th and 6th June.
Wowan: 8th and 9th June.
Bundaberg, 8th, 9th, and 10th June.
Lowood: 9th and 10th June.
Gladstone: 14th and 15th June.
Rockhampton: 20th to 24th June.
Mackay: 27th to 29th June.
Laidley: 28th and 29th June.
Kilcoy: 29th and 30th June.
Bowen: 5th and 6th July.
Gatton: 5th and 6th July.
Woodford: 6th and 7th July.
Ayr: 7th and 8th July.
Cleveland: 7th and 8th July.
Southport: 6th October.
Atherton: 25th and 26th July.

# THE JAVA WONDER CANE.

## A WARNING TO CANEGROWERS.

P.O.J.2878, or the "Java Wonder Cane," was bred at the East Java Sugar Experiment Station some ten years ago, and owes its name to the decided superiority in yielding capacity which it showed in comparison with all other standard varieties in that country. Under a wide range of soil and other environmental conditions, its consistent superiority was maintained; and in the course of five years 95 per cent. of the cane lands of Java were planted to the variety. On the better soils it outyielded E.K.28 to the extent of only 1 or 2 tons of cane per acre; but on the heavy wet lands yield trials showed that the new cane could produce crops 50 per cent. heavier than those under the old standard varieties. The influence which this new cane exerted on the crop returns of Java is an excellent illustration of what may be effected in the breeding of new varieties by a sustained effort along carefully-planned lines.

It was not until 1928 that the Bureau was able to obtain three sets of this cane; and when it had passed through its period of quarantine, steps were taken to propagate the variety as rapidly as possible, with a view to determining its value under Queensland conditions. Naturally, high hopes were entertained for this cane, which had shown such excellent results in the land of its origin. Although it has made a promising start in certain of our districts, it has been found to possess a number of unfavourable characteristics, particularly with regard to disease susceptibility. It is with the object of stressing these features, and urging growers generally to refrain from wholesale plantings of the cane, that these remarks are presented.

The cane gives, in general, a quick strike and a good stool, and is a good ratooner. Though it is rather a slow grower in its early stages, it later develops at a rapid rate, and under favourable conditions heavy tonnages have been recorded on trial plots. The variety is, unfortunately, a late maturer; and this is a serious drawback in areas where a succession of dry months during the winter and early spring may result in a collapse of the crop before it has attained maturity. Such conditions have been experienced in Mackay in the past three seasons with a sister cane, P.O.J.2714.

As regards C.C.S. content, the variety is inferior to our better class canes.

It is from the point of view of disease susceptibility that the "wonder" cane is particularly disappointing. In areas where downy mildew is prevalent, practically all of our propagation plots have been condemned as sources of plants, owing to the contraction of this disease. It is the opinion of our pathologist that this cane and P.O.J.2714 are the varieties most susceptible to this disease, at present grown in Queensland. When it is remembered that further plantings of this cane in proximity to B.208 will probably intensify the proportion of disease in the latter cane, it is felt that it would be suicidal to jeopardise the future of this valuable early maturing cane for one whose true worth has not been established, and which cannot be expected to show any superior features under these conditions.

In the far northern areas, where top rot disease makes its appearance under favourable climatic conditions, P.O.J.2878 is certain to suffer considerable damage. Again, this has proven to be one of the most susceptible varieties known, and heavy losses may be expected with spring plant cane or late ratoons. Under these conditions, April planting is practically essential if serious damage is to be obviated, should the following early summer conditions prove favourable for the development of the disease.

Fiji disease is sure to take very heavy toll of this cane in those areas where this malady is present. In certain areas of the Fiji Islands where the disease occurs the variety has been practically wiped out.

As regards Pokkah Boeng, the "wonder" cane exhibits the same susceptibility as its sister cane, P.O.J.2714. Although this disease is of rather minor importance with the majority of our standard varieties, it is liable to become serious with this cane. The entry of fungus diseases through the "knife cuts" in the stem, often brought about by Pokkah Boeng, results in the development of rots which effect a serious reduction in sugar content of the cane at harvest time.

It is only in the case of mosaic, and particularly gumming disease control, that P.O.J.2878 provides us with a very useful variety. In all of the resistance trials conducted to date, it stands at the head of the list of canes highly resistant to gumming. It is for this reason that we are attempting to effect a rapid propagation of the variety in the southern areas of the State, and the results to date are very encouraging. This year yield trials on a fairly extensive scale will give us a definite

indication of its superiority or otherwise, and much is hoped for. Of course, its success is not to be regarded as a solution of the gumming disease problem. The short-comings of the variety with respect to its lateness of maturity is a serious drawback, and it is absolutely essential that a resistant early maturer be found of satisfactory yielding capacity before it may be concluded that the disease is effectively under control.

From the above comments it must be concluded that the new cane does not measure up to the earlier anticipations of its merit. It is agreed that the cane is worthy of a thorough try-out, and except for those areas where the abovementioned serious diseases are prevalent, plantings on a modest scale will be made this year. As a result of a further season's observations, it is hoped that sufficient specific data will be available to warrant a definite statement as to its suitability or otherwise over the wide range of Queensland growing conditions.

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# Answers to Correspondents.

## BOTANY.

### Yellow Plum

H.A.S. (Clermont)—

The specimen is *Ximenia americana,* sometimes called Yellow Plum. This is a fairly widely distributed plant and seems to be fairly common at Clermont. It has been noted that the aborigines ate the fruit, but we have no definite information as to the suitability or otherwise of the flesh or kernel for the white races. The green parts of the plant have been found to contain a prussic-acid-yielding glucoside.

### Hairy Indigo.

O.L.H. (Mareeba, N.Q.)—

The specimen is the Hairy Indigo, *Indigofera hirsuta,* a native of Queensland, also found through the Malayan region to India. The plant is not known to possess any harmful properties, but we do not know that it has any particular economic value.

### Wheat Grass.

D.Y. (Kingaroy)—

The specimen is *Agropyron scabrum,* sometimes known as Wheat Grass, fairly common in parts of Queensland, particularly on the Darling Downs. In New South Wales and the cooler parts of this State it is generally looked upon as a valuable stock food, but in the hotter parts, and particularly on infertile or barren soils, it becomes unpalatable and not of much value.

### Rattle Pod.

W.R.S. (Rockhampton)—

The specimen is *Crotalaria trifoliastrum,* a small species of Rattle Pod. This plant is very common in various parts of Queensland, and has been suspected of poisoning stock on one or two occasions. No feeding tests have been carried out with the plant, but in view of the known poisonous nature of several members of the genus *Crotalaria,* both in Australia and abroad, it is as well to regard the plant with suspicion.

J.J. (Glass House Mountain)—

The specimen is *Crotalaria striata,* a species of Rattle Pod widely spread over the tropical regions of the world. It is very common in parts of coastal Queensland. It has been definitely proved by feeding tests to be poisonous to live stock, though, as a general rule, stock seem to leave it untouched, or at least they only eat the plant to a limited extent unless forced to it by absence of other feed. In Ceylon and some other tropical countries the plant is much utilised as a green manure.

### Prickly Poppy.

INQUIRER (Longreach)—

The specimen is not Saffron or Star Thistle, but the Prickly Poppy (*Argemone mexicana*), a gazetted noxious weed. The plant has been accused of poisoning stock on several occasions, but is rarely eaten by them. The only cases of poisoning that have come under our notice have been where the plants have been cut and allowed to wilt and where calves have eaten the wilted, and consequently softened, plants.

# PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were completed during the month of February, 1933 (273 days period unless otherwise stated).

| Name of Cow. | Owner. | Milk Production. | Butter Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| | JERSEY. | | | |
| | MATURE COWS (OVER 5 YEARS), STANDARD 350 LB. | | | |
| Shamrock Farm Jean | J. Hunter and Sons, Borallon | 8,532·37 | 537,072 | Shamrock Farm Palatine |
| Prospect Dewdrop 13th | J. McInally, Brassall | 9,179·73 | 508·827 | Oxford Valentine |
| Oxford Golden Spray | E. Burton and Sons, Wanora | 7,680·71 | 488·477 | Oxford Palatine |
| Pine View Rosina | J. Hunter and Sons, Borallon | 6,103·81 | 394·969 | Oxford Renown |
| | SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB. | | | |
| Oxford Rose Marie | E. Burton and Sons, Wanora | 8,363·47 | 556·287 | Oxford Buttercups King |
| Oxford Joyful | ditto | 7,493·01 | 452·756 | ditto |
| | JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB. | | | |
| Lyndhurst Molly | J. B. Keys, Gowrie Little Plain | 10,165·39 | 480·188 | Noble King of Ogilvie |
| | JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | |
| Poppy of Calton | C. Burrow, Goomeri | 7,084·43 | 388 | Retford Meteor |
| | SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD, 250 LB. | | | |
| Princess Mary of Inverlaw | R. J. Crawford, Inverlaw | 6,120·65 | 298·918 | Masterpiece Yeribee of Bruce Vale |
| | JUNIOR, 2½ YEARS (UNDER 2½ YEARS), STANDARD, 230 LB. | | | |
| Dewdrop 4th of Golden Hill | C. Klaus, Mundubbera | 6,881 | 376·929 | Lily's Triumph of Golden Hill |
| Eldon Olga | J. B. Keys, Gowrie Little Plain | 5,424·76 | 301·608 | Retford Raleigh Chief |
| Langside Golden Buttercup | R. J. Crawford, Inverlaw | 5,960·6 | 299·399 | Masterpiece Yerrabee of Bruce Vale |
| Glenview Alfriston Dora | F. P. Fowler and Sons, Coalstoun Lakes | 4,889·45 | 286·712 | Glenview Alfriston Duke |
| Wyreene Trixie | J. B. Keys, Gowrie Little Plain | 6,096·13 | 279·506 | Lyndhurst Victor |
| Trinity Jolly Mayoress | E. J. O'Keefe, Nambour | 4,155·55 | 277·243 | Trinity Perfection |
| Mae of Karoola | N. Alcorn, Maleny | 4,570·6 | 265·654 | Carnation Buttercup's Raleigh |
| Night Shade II. of Rosedale | Wakefield Bros., Upper Barron | 4,601·25 | 262·373 | Carnation Lad |

## AUSTRALIAN ILLAWARRA SHORTHORNS.

| | | | | |
|---|---|---|---|---|
| **MATURE COWS (OVER 5 YEARS), STANDABD, 350 LB.** | | | | |
| Pearlie of Hillingdon | J. Phillips, Wondai | 17,146·47 | 642·323 | Rufus of Sunnyview |
| Fancy 9th of Rosemount | A. J. Bryce, Maleny | 12,071·8 | 487·021 | Bright Star of Cosey Camp |
| Favourite of Norden | R. Mears, Toogoolawah | 12,096·75 | 476·589 | George of Nestles |
| Model 11th of Springdale | F. G. Lankin, Kaimkillenbun | 10,018·56 | 356·17 | Mascot of Springdale |
| **SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.** | | | | |
| Blossom II. of Oakvilla | H. Marquardt, Wondai | 13,880·73 | 533·217 | Victory of Greyleigh |
| Duchess 10th of Oakvilla | ditto | 11,851·99 | 420·854 | ditto |
| **JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.** | | | | |
| Princess 11th of Oakvilla | H. Marquardt, Wondai | 8,248·04 | 353·922 | Gordon of Swanlea |
| Lady Jean 5th of Blacklands | A. Pickels, Wondai | 8,729·65 | 313·854 | Fussy's Monarch of Blacklands |
| Fairy 6th of Blacklands | ditto | 7,878·8 | 292·287 | ditto |
| Verresdale Beauty | J. L. Lyndon, Worongary | 5,956·51 | 238·283 | Emperor of Blacklands |

## FRIESIAN.

| | | | | |
|---|---|---|---|---|
| **MATURE COW (OVER 5 YEARS), STANDARD 350 LB.** | | | | |
| College Pontiac Princess | Hickey and Sons, Wilston | 19,314·6 | 657·465 | Pabst Pontiac Blue Star |
| **JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.** | | | | |
| Oaklands Beauty Rock 4th | W. Richters, Tingoora | 7,368·52 | 268·846 | Pied Rock |

# PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Guernsey Cattle Society, production charts for which were completed during the month of April, 1933 (273 days period unless otherwise stated).

| Name of Cow. | Owner. | Milk Production. | Butter Fat. | Sire |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| | AUSTRALIAN ILLAWARRA SHORTHORNS. | | | |
| | MATURE COWS (OVER 5 YEARS), STANDARD, 350 LB. | | | |
| Kilbirnie Bella 12th | Macfarlane Bros., Radford | 12,603 | 530·135 | Darbalara of Kilbirnie |
| Evelyn of Corunna | C. O Sullivan, Greenmount | 10,269·25 | 443·647 | Exchange of Balmoral |
| Charm II. of Wilga Vale | ditto | 11,890·5 | 431·539 | Reliance of Blacklands |
| Rosenthal Handsome 3rd | S. Mitchell, Warwick | 8,624·5 | 365·89 | Admiration II. |
| | SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB. | | | |
| Blacklands Gentle III. | N. V. Slaughter, Harrisville | 11,031·12 | 428·527 | Fussys Monarch of Blacklands |
| | JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB. | | | |
| Rosenthal Fuchsia 6th | S. Mitchell, Warwick | 9,371·5 | 372·361 | Model's Emblem |
| | SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | |
| Bracelet of Morden | R. Mears, Toogoolawah | 11,074·65 | 454·336 | George of Nestles |
| Fairlie's Beauty 17th | C. B. Mitchell, Fairlie | 8,438·5 | 355·544 | Dividend |
| | JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | |
| Meadowvale Daisybelle III. | C. O'Sullivan, Greenmount | 9,740·25 | 447·422 | Plumstone of Meadowvale |
| Blacklands Truetype V. | D. Logan, Booval | 9,238·96 | 426·316 | Red Prince of Blacklands |
| Fairlie Favourite 15th | C. B. Mitchell, Warwick | 8,312·25 | 345·477 | Dividend of Rosenthal |
| | SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | |
| Little Dot of Trevlac | W. J. Freeman, Rosewood | 7,840·5 | 346·121 | Butter Boy |
| Rosina II. of Applegarth | J. A. Reading, Cloyna | 7,956·65 | 314·443 | Ainslie of Burradale |
| | JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | |
| Model 3rd of Alfavale | W. H. Thompson, Nanango | 9,788·3 | 411·280 | Reward of Fairfield |
| Lovely 3rd of Alfavale | ditto | 8,602·15 | 359·661 | ditto |
| Model 27th of Springdale | F. G. Lamkin, Kaimkillenbun | 8,026·28 | 322·928 | Young Commodore of Springdale |
| Maggie 9th of Rosenthal (272 days) | ditto | 8,114·03 | 296·667 | Surplus of Rosenthal |
| College Queen | Queensland Agricultural High School and College, Gatton | 6,858·63 | 259·028 | Fussys Kitchener |
| Wandegong Red Rose | G. D. Lindenmeyer, Mundubbera | 5,972·45 | 238·296 | Emperior of Spurfield |

| | | | | |
|---|---|---|---|---|
| **JERSEY.** | | | | |
| MATURE (OVER 4½ YEARS), STANDARD 350 LB. | | | | |
| Oxford Ginger Girl | E. Burton and Sons, Wanora | 8,284·23 | 547·721 | Oxford Renown |
| Pineview Star | J Hunter and Sons, Borallon | 8,839·9 | 498·477 | Carnation Lad |
| Gentle 3rd of Oakview | F. H. Denning, Kandanga | 7,720 | 431·7 | Grasmere's Merryboy |
| Lady Crocus | J. Nicol Robinson, Maleny | 7,313·25 | 365·259 | Retford Statesman |
| JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB. | | | | |
| Oxford Snowdrop | E. Burton and Sons, Wanora | 7,227·71 | 394·383 | Trinity Ambassador |
| SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | | |
| Pineview Model | J. Hunter and Sons, Borallon | 8,381·37 | 585·947 | Pineview Noble Lad |
| Oxford Sirius | E. Burton and Sons, Wanora | 7,799·23 | 498·115 | Trinity Ambassador |
| Oxford Aster | ditto | 7,348·64 | 481·01 | ditto |
| JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | | |
| Oxford Bluebird | E. Burton and Sons, Wanora | 7,972·11 | 468·117 | Trinity Ambassador |
| SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | | |
| Trinity Hazeldale | J. Sinnamon and Sons, Moggill | 4,928·83 | 314·413 | Trinity Governor |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| Oxford Aster Daisy | E. Burton and Sons, Wanora | 5,801·49 | 386·876 | Trinity Ambassador |
| Pineview Noble Buttercup | J. Hunter and Sons, Borallon | 6,149·17 | 359·226 | Pineview Noble Lad |
| Diana of Karoola (365 days) | N. Alcorn, Maleny | 6,263·45 | 355·541 | Carnation Buttercups Raleigh |
| Golden Fern of Inverlaw | R. J. Crawford, Inverlaw | 5,055·1 | 300·727 | Langside Claribells Masterpiece |
| Trinity Poppy | J. Sinnamon and Sons, Moggill | 5,209·78 | 274·444 | Trinity Perfection |
| Carnation Gentle | W. Spresser and Sons, Brassall | 5,402·97 | 277·177 | Carnation Daisy's Hero |
| Carnation Princess | ditto | 4,909·5 | 276·382 | Carnation Renown |
| Carnation Fairy's Hope | ditto | 4,484·25 | 265·368 | Carnation Daisy's Hero |
| Daphne of Burnleigh (251 days) | W. Mallet, Nambour | 4,976·95 | 251·644 | Trinity Darby |
| **GUERNSEY.** | | | | |
| SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | | |
| Linwood Gloria | A. S. Cooke, Maleny | 5,394·8 | 262·225 | Moongi Sylph Show Boy |

# The Home and the Garden.

## OUR BABIES.

*Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.*

### HEALTH AND CHILDBIRTH.

CHILDBIRTH should, with very rare exceptions, be compatible with perfect health. At present it is often not so, and the responsibility for this rests largely with the women themselves. In Great Britain, where the mortality from childbirth is lower than in Queensland, this mortality and the still more frequent cases of invalidism from childbirth is causing very serious concern, as will be seen from the following extract:—

"A conference under the auspices of the Edinburgh Branch of the National Council of Women and of the Edinburgh Women Citizens' Association was held in the Scottish House of the B.M.A. in Edinburgh on 13th February, Mrs. Chalmers Watson, M.D., presiding. Dr. James Young, President of the Edinburgh Obstetrical Society, in an address to the conference, said that each year in Great Britain about 4,000 women lost their lives and 70,000 incurred impairment of health through childbirth. For many years this amount of death and damage had been practically stationary, despite efforts involving the expenditure of much public money. It was important to recognise that this was not due to lack of knowledge regarding the medical and obstetric conditions that endangered women. It was due rather to a failure to bring to women throughout the country the knowledge which was available; this was convincingly demonstrated by the fact that where women were adequately cared for the risk of maternity was very small. In the lying-in hospital of a poor London district, where some 26,000 women had attended, the mortality was only 1.3 per 1,000, as compared with the general English rate of 3.3 per 1,000. In another hospital, 21,500 women had been attended with a mortality rate of 0.8 per 1,000. When these results were examined, it was found that care had been taken of the women during pregnancy, and if any serious abnormality had developed the women were treated early and safely in hospital. Normal and healthy cases had been attended at home by midwives and pupil midwives under supervision. Further, the willing and understanding co-operation of the women themselves had been obtained. When the failure to reduce mortality over the country was examined, two chief considerations were found—first, that most of the women in the community were attended by midwives and doctors engaged in independent practice, and many of these had not been adequately trained in the methods of ante-natal care; and, secondly, that the local authorities had not sufficiently realised the need for linking up their ante-natal clinics with midwives, doctors, and hospitals, and much expensive effort had consequently been wasted.

"There was need for improved education of the midwife and the student, and for improvement in administration. Lady Cynthia Colville, addressing the conference, said that, since a national maternity service was still far off, everything should be done to encourage women to attend ante-natal and post-natal clinics. Many women had no ante-natal care at all; attention to this matter would help to make motherhood the safe things it ought to be."

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## FLOWER GARDEN.

Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds,

pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna lily, and other bulbs. Put away dahlia roots in some warm moist spot, where they will start gently and be ready for planting out in August and September.

No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring-time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lots, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground. Many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors; plant bulbs such as anemones, ranunculus, fresias, snowflakes, ixias, watsonias, iris, narcissus, daffodil, &c. The Queensland climate is not suitable for tulips.

To grow these plants successfully it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

## KITCHEN GARDEN.

Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough until required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. When the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower and take up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

The continued production of rhubarb may be greatly assisted by giving a heavy mulching of manure and hoeing it well into the soil. Keep the beds well watered, and give regularly a dressing of liquid manure, say, once a week.

It is not necessary to use forcing manures on the young stock, as plants are ruined if forced in the early stages of growth.

The rhubarb makes rapid growth during the autumn and spring, and when stalk cutting has been started liquid manuring and manuring may be given.

# Farm Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early-flowering period—i.e., when about one-third of the plants in the crop are in flower.

# Orchard Notes for July.

## THE COASTAL DISTRICTS.

THE marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated, do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be

renovated; but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description or the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing; well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JULY is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

In pruning, follow the advice given in the May number; and if you are not thoroughly conversant with the work, get the advice of one of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is under-sized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime sulphur.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

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## WORK IN THE CITRUS ORCHARD.

The low returns received by citrus growers during the past two seasons has forced upon them a realisation of the fact that the utmost economy must be practised in production methods. There is at least one direction in which improved production can be achieved without increasing expenditure, and that is by producing fruit of a better commercial size (write officers of the Fruit Branch of the New South Wales Department of Agriculture in current notes). In coastal areas too great a proportion of citrus fruits is on the small size. Satisfactory size in fruit is mainly dependent on sufficient soil moisture and a thrifty tree condition.

Increasing the soil's capacity to retain moisture in established groves is possible only by increasing the organic content of the soil. In soil so improved the trees are enabled to send their roots down to a deeper feeding zone. In this connection the value of green manure crops should not be overlooked.

In green manuring trials carried out over several years and in many different types of soils purple vetch has proved a very consistent and heavy producer. During wet seasons on the coast it is much more reliable than field peas. A sowing of from 10 to 20 lb. purple vetch seed per acre is economical, especially if drilled in with 1 cwt. of superphosphate. Under inland conditions the tick bean is the most satisfactory green crop. Many orchardists rely on weed growth for the supply of organic matter, but this is not sufficient, as is evidenced by the fact that many trees growing under such conditions are difficult to maintain in a thrifty state.

Another factor that assists in the satisfactory development of citrus fruits is the maintenance of the leaf-bearing area of the trees. In this relation timeliness of spraying may have a not unimportant influence. When spraying operations are delayed, heavier applications than would otherwise be necessary have to be used. Particularly is this the case where white wax scale has to be combated, where if control measures are so delayed that it becomes necessary to use larger amounts of soda or to have recourse to the use of certain spray oils, defoliation in some degree may result.

## CLIMATOLOGICAL TABLE—APRIL, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. Means. Max. | Means. Min. | Extremes. Max. | Date. | Min. | Date. | Rainfall. Total. | Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| *Coastal.* | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| Cooktown .. .. | 29·91 | 85 | 74 | 90 | 1 | 71 | 27 | 1,686 | 15 |
| Herberton .. .. | .. | 75 | 62 | 85 | 1 | 57 | 8,13, 20 | 698 | 20 |
| Rockhampton .. .. | 30·02 | 85 | 66 | 94 | 6 | 58 | 22 | 157 | 4 |
| Brisbane .. .. | 30·11 | 78 | 62 | 90 | 12 | 56 | 25 | 894 | 9 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. | 30·08 | 81 | 54 | 94 | 12 | 42 | 14 | 124 | 4 |
| Stanthorpe .. .. | .. | 72 | 47 | 82 | 11, 12 | 33 | 14 | 157 | 6 |
| Toowoomba .. .. | .. | 73 | 53 | 85 | 12 | 42 | 14 | 368 | 7 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·88 | 93 | 69 | 98 | 8, 9, 12 | 60 | 7, 8, 9 | Nil | |
| Longreach .. .. | 29·97 | 91 | 63 | 99 | 3 | 55 | 15 | Nil | |
| Mitchell .. .. | 30·07 | 83 | 54 | 91 | 3 | 41 | 14 | 98 | 2 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 29·89 | 92 | 71 | 99 | 8 | 63 | 3 | 52 | 3 |
| Boulia .. .. | 29·97 | 91 | 64 | 99 | 9,10,11 | 51 | 15 | Nil | |
| Thargomindah .. .. | 30·05 | 85 | 61 | 97 | 9, 11 | 52 | 15 | 9 | 2 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING APRIL, 1933 AND 1932, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. April. | No. of Years' Records. | Total Rainfall. April, 1933. | April, 1932. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 4·07 | 32 | 11·35 | 0·83 |
| Cairns .. .. | 11·38 | 51 | 18·63 | 1·16 |
| Cardwell .. .. | 8·86 | 61 | 9·09 | 3·01 |
| Cooktown .. .. | 8·61 | 57 | 16·86 | 1·60 |
| Herberton .. .. | 3·82 | 47 | 6·98 | 1·55 |
| Ingham .. .. | 7·94 | 41 | 3·01 | 2·32 |
| Innisfail .. .. | 19·86 | 52 | 24·19 | 6·92 |
| Mossman Mill .. | 8·10 | 20 | 22·19 | 1·26 |
| Townsville .. .. | 3·44 | 62 | 5·61 | 1·24 |
| *Central Coast.* | | | | |
| Ayr .. .. | 2·55 | 46 | 2·76 | 0·50 |
| Bowen .. .. | 2·78 | 62 | 2·74 | 1·08 |
| Charters Towers .. | 1·56 | 51 | 0·55 | 0·48 |
| Mackay .. .. | 6·39 | 62 | 4·61 | 1·93 |
| Proserpine .. .. | 5·90 | 30 | 5·95 | 2·89 |
| St. Lawrence .. | 2·86 | 62 | 1·97 | 0·62 |
| *South Coast.* | | | | |
| Biggenden .. .. | 2·15 | 34 | 3·69 | 1·88 |
| Bundaberg .. .. | 3·07 | 50 | 5·83 | 2·15 |
| Brisbane .. .. | 3·83 | 82 | 8·94 | 5·36 |
| Caboolture .. .. | 4·32 | 46 | 8·85 | 6·85 |
| Childers .. .. | 2·83 | 38 | 3·50 | 2·73 |
| Crohamhurst .. | 6·59 | 40 | 12·61 | 10·91 |
| Esk .. .. | 3·06 | 46 | 4·98 | 6·19 |
| Gayndah .. .. | 1·46 | 62 | 2·92 | 4·37 |
| Gympie .. .. | 3·43 | 63 | 3·47 | 7·25 |
| Kilkivan .. .. | 2·28 | 54 | 2·42 | 5·31 |
| Maryborough .. | 3·80 | 61 | 3·65 | 7·73 |
| *South Coast—continued—* | | | | |
| Nambour .. .. | 6·15 | 37 | 11·98 | 7·92 |
| Nanango .. .. | 1·98 | 51 | 2·24 | 6·19 |
| Rockhampton .. | 2·62 | 62 | 1·57 | 3·02 |
| Woodford .. .. | 4·50 | 46 | 14·32 | 7·17 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 1·40 | 63 | 1·24 | 4·55 |
| Emu Vale .. .. | 1·37 | 37 | 2·00 | 4·63 |
| Jimbour .. .. | 1·38 | 45 | 1·07 | 4·22 |
| Miles .. .. | 1·48 | 48 | 1·87 | 4·28 |
| Stanthorpe .. | 1·76 | 60 | 1·57 | 4·76 |
| Toowoomba .. | 2·59 | 61 | 3·68 | 4·88 |
| Warwick .. .. | 1·67 | 68 | 1·81 | 4·25 |
| *Maranoa.* | | | | |
| Roma .. .. | 1·37 | 59 | 0·87 | 2·28 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 1·29 | 19 | 1·15 | 1·36 |
| Gatton College .. | 1·89 | 34 | 1·91 | 4·56 |
| Gindie .. .. | 1·20 | 34 | .. | 1·24 |
| Hermitage .. | 1·45 | 27 | 1·82 | 4·87 |
| Kairi .. .. | 3·76 | 19 | .. | 0·70 |
| Mackay Sugar Experiment Station | 4·96 | 36 | 4·40 | 2.75 |

GEORGE E. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

### AT WARWICK.

| | June, 1933. | | July. 1933. | | MOONRISE. June, 1933. | MOONRISE. July. 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | p.m. | a.m. |
| 1 | 6·37 | 5·1 | 6·45 | 5·7 | 12·3 | 11·38 |
| | | | | | | p.m. |
| 2 | 6·37 | 5·1 | 6·45 | 5·7 | 12·35 | 12·10 |
| 3 | 6·38 | 5·1 | 6·45 | 5·7 | 1·6 | 12·47 |
| 4 | 6·38 | 5·1 | 6·45 | 5·7 | 1·37 | 1·33 |
| 5 | 6·38 | 5·1 | 6·45 | 5·7 | 2·15 | 2·31 |
| 6 | 6·39 | 5·1 | 6·45 | 5·7 | 2·47 | 3·35 |
| 7 | 6·39 | 5·1 | 6·45 | 5·8 | 3·50 | 4·46 |
| 8 | 6·40 | 5·2 | 6·45 | 5·8 | 4·53 | 5·58 |
| 9 | 6·40 | 5·2 | 6·45 | 5·9 | 6·0 | 7·5 |
| 10 | 6·40 | 5·2 | 6·44 | 5·9 | 7·10 | 8·13 |
| 11 | 6·41 | 5·2 | 6·44 | 5·10 | 8·19 | 9·17 |
| 12 | 6·41 | 5·2 | 6·44 | 5·11 | 9·27 | 10·14 |
| 13 | 6·41 | 5·2 | 6·44 | 5·11 | 10·33 | 11·11 |
| 14 | 6·41 | 5·2 | 6·43 | 5·12 | 11·30 | .. |
| | | | | | | a.m. |
| 15 | 6·42 | 5·3 | 6·43 | 5·12 | .. | 12·8 |
| | | | | | a.m. | |
| 16 | 6·42 | 5·3 | 6·43 | 5·13 | 12·25 | 1·4 |
| 17 | 6·42 | 5·3 | 6·42 | 5·13 | 1·19 | 2·0 |
| 18 | 6·42 | 5·3 | 6·42 | 5·14 | 2·15 | 2·53 |
| 19 | 6·42 | 5·3 | 6·42 | 5·14 | 3·10 | 3·49 |
| 20 | 6·43 | 5·4 | 6·41 | 5·15 | 4·7 | 4·42 |
| 21 | 6·43 | 5·4 | 6·41 | 5·15 | 5·0 | 5·33 |
| 22 | 6·43 | 5·4 | 6·41 | 5·15 | 5·54 | 6·19 |
| 23 | 6·43 | 5·4 | 6·40 | 5·16 | 6·46 | 7·0 |
| 24 | 6·43 | 5·5 | 6·40 | 5·16 | 7·35 | 7·38 |
| 25 | 6·44 | 5·5 | 6·39 | 5·17 | 8·20 | 8·7 |
| 26 | 6·44 | 5·5 | 6·39 | 5·17 | 9·0 | 8·39 |
| 27 | 6·44 | 5·5 | 6·38 | 5·18 | 9·34 | 9·9 |
| 28 | 6·44 | 5·6 | 6·38 | 5·18 | 10·6 | 9·39 |
| 29 | 6·44 | 5·6 | 6·37 | 5·19 | 10·36 | 10·12 |
| 30 | 6·44 | 5·6 | 6·37 | 5·19 | 11·6 | 10·48 |
| 31 | .. | .. | 6·36 | 5·20 | .. | 11·30 |

## Phases of the Moon, Occultations, &c.

| | | | | |
|---|---|---|---|---|
| 1 June | ☾ | First Quarter | 9 53 p.m. |
| 8 ,, | ○ | Full Moon | 3 5 p.m. |
| 15 ,, | ☽ | Last Quarter | 9 25 a.m. |
| 23 ,, | ● | New Moon | 11 22 a.m. |

Perigee, 8th June, at 1.24 p.m.
Apogee, 22nd June, at 12.18 a.m.

It will be noticed during the first week in June how close Mars and Jupiter seem to one another, especially on the night of the 4th. Mars will then be only about a third of a degree above Jupiter when they come into view after sunset.

On the 8th after sunset Venus and Mercury will be sufficiently high above the western horizon to form an interesting spectacle, the full Moon being well removed, on the opposite side of the sky.

The occultation of Antares which will occur before 4 a.m. on the 8th will be an interesting occurrence, even without a telescope, though binoculars will be useful to see Antares near the full Moon. both before and after the occultation.

On the 10th Sigma Sagittarii will be occulted, but sunrise will interfere with this as a popular spectacle.

On the 12th at 3 p.m. the Moon will be passing from west to east of Saturn, which will be about the Moon's diameter to the north of it. With a pair of binoculars this will form an interesting daylight spectacle, the Moon being rather more than half full.

On the 22nd of June, at 7 a.m., the Australian Winter Solstice will occur. The Sun, having reached its utmost limit northward seems to stand still before turning to the south.

The Moon will pass Neptune on the 28th at midnight. The planet will then be 2 degrees north of the Moon, amongst the small stars of Leo, where it will be somewhat difficult to distinguish it.

The occultation of Regulus on the 28th will take place some hours before the Moon and star have risen.

At 6 p.m. on the 29th the Moon will be passing Jupiter which will be 3 degrees northward of it, and both will be high up in the north-west. On the next day the Moon will pass Mars, 3 degrees to the south of it, at midday. Binoculars will be necessary to see Mars as the Moon will be half full.

Mercury sets only about 12 minutes after the Sun on the 1st, and 1 hour 18 minutes after it on the 15th.

Venus sets 43 minutes after the Sun on the 1st, and 1 hour 2 minutes after it on the 15th.

The Southern Cross will be perpendicular about 2 a.m. on the 1st and at midnight on the 30th June.

| | | | |
|---|---|---|---|
| 7 July | ○ | Full Moon | 9 50 p.m. |
| 14 ,, | ☽ | Last Quarter | 10 23 p.m. |
| 23 ,, | ● | New Moon | 2 3 a.m. |
| 30 ,, | ☾ | First Quarter | 2 43 p.m. |

Perigee, 6th July, at 10·24 p.m.
Apogee, 19th July, at 9·20 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

*Supplement to the "Queensland Agricultural Journal," October, 1933.*

# QUEENSLAND AGRICULTURAL JOURNAL.

VOL. XXXIX. PARTS 1 TO 6.

## GENERAL INDEX.

# INDEX TO ILLUSTRATIONS.



DAVID WHYTE, Acting Government Printer.

*Supplement to the "Queensland Agricultural Journal," February, 1934.*

VOLUME XL

# QUEENSLAND AGRICULTURAL JOURNAL

Issued by direction of

The Hon. the Secretary for Agriculture

Edited by J. F. F. REID

JULY to DECEMBER, 1933

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

# QUEENSLAND AGRICULTURAL JOURNAL

VOL. XL. 1 JULY, 1933. PART 1.

## Event and Comment.

### The Queensland System of Orderly Marketing.

COMMENTING on the published statement of a prominent Southern critic, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, informed the metropolitan press recently that at the Sydney Conference of Ministers for Agriculture in May, agenda item 56, which was submitted by New South Wales, provided for the introduction, if deemed advisable, of legislation by the Commonwealth and all the States similar to the Federal Act governing the marketing of dried fruits. The Ministerial conference carried a resolution that the Commonwealth Government be asked to introduce legislation, similar to the Dried Fruits Act, providing for the appointment of commodity boards for the control and marketing of farm products. This resolution was subsequently referred to the Hon. F. H. Stewart, M.P., Federal Minister for Commerce, who stated that the policy of the Commonwealth Government had been to assist industry to regulate itself by giving statutory powers to approved control boards in which, after very definite evidence had been adduced, the industry concerned was desirous of such control. He was of the opinion that the Federal Government may lead to this policy rather than adopt a general principle, but he promised to bring before the Federal Cabinet for consideration, as a matter of urgency, the request embodied in the resolution passed by the conference. It would appear from that, said Mr. Bulcock, that the Minister of Agriculture in the Queensland Labour Government is not the driving force urging the general adoption of such legislation. Continuing, he added:—

> It is true that the Theodore Government, some years ago, was responsible for a primary producers' organisation, but my critic is sadly at fault when he suggests, by inference, that a system of organisation was forced on the growers.

No commodity pool is possible in Queensland without the consent of the majority of the growers concerned, and our experience in this State very definitely indicates the advantages of an organised system of marketing. It is significant that chambers of commerce repeatedly urge organisation of the secondary industries, but apparently grudge the primary producer an organisation that he himself controls. Commodity boards do not represent the Crown nor can commodity boards function except with the consent of the producer, and the administration boards are not a charge upon the Crown.

The president of the Associated Chambers of Commerce in the Commonwealth, Mr. Spencer Watts (the critic referred to), makes the statement that "the history of compulsory pools and similar forms of so-called orderly marketing throughout the world has proved calamitous." This, of course, is at variance with the facts of the case. Had they proved calamitous in Queensland, they could not have survived. The fact that they have survived shows that they discharge a need that the grower recognises.

A conference of major importance sitting in London at the present time, dealing with economic world problems of the first magnitude, has devoted quite a lot of its time to the organisation of agriculture, and it is impossible to divorce the organised form of agriculture from organised marketing.

Continuing, Mr. Bulcock said: "State-controlled organisations, so far as pooling is concerned, do not exist in Queensland. They are farmer-controlled in their entirety. I recollect, when Mr. Theodore introduced "*The Primary Products Pools Acts*, 1922 *to* 1923," the then Opposition suggested just the things that Mr. Spencer Watts has apparently in the back of his mind, including the socialisation of farming. Our first Director of Marketing, Mr. Macgregor, it was alleged, was appointed to socialise primary production, but after several years a change of Government took place and the National-Country Party attained office. During the tenure of office of that party the Primary Producers' Organisation Acts and kindred legislation were not revoked, so that they have definitely stood the test of time and have gained the good opinion of both major political parties in Queensland. Had this legislation been confiscatory in its incidence, or Bolshevik in its tendencies, then is it not safe to assume that the late anti-Labour Government would have displayed great zeal in removing it from the Statute-book?

"Another fact that very clearly emerges is that agriculture in Queensland is on a sounder commercial basis than agriculture in any other State of the Commonwealth. Producers themselves, generally speaking, desire to continue their organisation.

"One of the most important agricultural conferences of recent times assembled in Sydney last month to discuss ways and means whereby agricultural organisation and orderly marketing may be maintained. Would Mr. Spencer Watts suggest that these people do not know their own business, or would he suggest that the farmer must always be a vassal to the commercial interests of a State? However, the policy of the present Queensland Government is to maintain a sound system of orderly marketing, and, in common with Ministers of other States, I very definitely hope that the Commonwealth Government will recognise the magnitude of the issues involved, and will come to the assistance of the States in order that we may consolidate our position. The alternative is economic chaos."

## St. Lucia Farm School—Trainees Available for Employment.

AT the end of this month twenty-five boys who will have completed their training will be available for employment in the country; at the end of October another twenty-five will be available for work on farms, and thereafter a similar number will be available every three months. As each group leaves, the place of each member will be filled to keep the strength of the school up to fifty, the prescribed number. At the end of each half-yearly period two boys from each group of fifty will be granted scholarships at the Queensland Agriculturual College at Gatton.

The St. Lucia Farm School was opened under the aegis of the Department of Agriculture and Stock by the Minister, Hon. Frank W. Bulcock, on 31st January, with fifty boys, ranging in age from seventeen to twenty years, all coming from the Greater Brisbane area, and with Mr. F. O. Bosworth, B.A., of the staff of the Queensland Agricultural College and High School, in charge. The Principal has the assistance of a competent field staff, and the curriculum embraces the regular routine of a diversified farm. Practical instruction is also given in all forms of pioneering work, including tree felling, sawing, splitting, fencing, and the general use of bush timber for the hundred and one jobs around a farm. The agricultural and dairying course covers instruction in ploughing, harrowing, sowing, fodder conservation, several branches of animal husbandry, and dairying routine. Officers of the Department of Agriculture and Stock visit the farm daily to give instruction in dairying practice, pig raising, poultry raising, fruit and vegetable growing, botany, soil chemistry, insect and vegetable pest control, and general farming subjects. Besides the farm school proper, a canvas camp has been established in forest land at Moggill, where the boys receive instruction in bush work and obtain and supply fencing and other timber for use at the school. Groups of boys are also sent in turn to Beerburrum, where they receive field instruction in tobacco growing and curing and grading of tobacco leaf. The boys are also taken on occasional visits to the Roma Street produce markets and to the butter factory and piggeries at Kingston.

Piggeries—portable and permanent—have been built by the boys on the farm; five brood sows of the Tamworth and Berkshire breeds are housed there, and litters of pedigree pigs are being raised, chiefly for instructional purposes.

A dairy herd of twenty grade Jerseys is kept. Practical instruction in herd testing is given, and groups of boys visit the Department of Agriculture and Stock in turn for further instruction in this important branch of animal husbandry.

Both disc and mouldboard ploughs are used on the farm, and the boys have been very quick to learn the elementary principles of cultivation. Already they have laid down 2½ acres of lucerne and an acre each of rye and barley. In addition, they have prepared 15 acres for summer crops.

Elementary blacksmithing, handling and care of farm machinery, and the running of internal combustion engines also forms part of the general training.

A fine football field has also been cleared and laid out, also a tennis court.

As to the general character of the boys, no one could meet a brighter lot. On a visit to the farm one is immediately struck with their manly bearing. They are keen, intelligent, and eager to learn all about each job. In short, they represent the average type of healthy Australian young manhood with a high standard of conduct, a good educational grounding, a strong spirit of self reliance, cheerful outlook on life, and a determination to succeed if given the opportunity.

From the foregoing the value of the training received and the character of the boys themselves will be appreciated readily by farmers in need of intelligent and willing assistance on their holdings, and it is believed that there will not be the slightest difficulty in placing the boys in rural employment on completion of their training term. Any farmer needing the services of one or a couple of trainees should place himself immediately in communication with the Lads Employment Bureau, Box 1448T General Post Office, Brisbane. Already a very strong demand for the boys' services has set in, so early application is advised.

## The Quality of Queensland Butter.

PROMINENCE has been given to certain figures dealing with the percentages of choice butters exported from the different States, and that these figures, to the uninitiated, reflect on the quality of Queensland butter is the opinion of the Minister for Agriculture, Hon. Frank W. Bulcock, as expressed in the course of recent comment on the butter position.

An analysis of the position shows, he remarked, how really misleading these figures are. The quantities of butter dealt with have reference to the export quota only, and have no bearing on the total production. There is a wide variation in the quantities of butter submitted for export by the different States in comparison with their production. The Commonwealth grading officers examine only the butters submitted for export overseas, and consequently in some of the States they review the quality of a comparatively smaller percentage of the output. All that the Commonwealth figures can really guarantee is that they have found 25.7 per cent. of the production of New South Wales, 32.1 per cent. of Victoria and Tasmania, and 24.8 per cent. of Queensland production to be of choice grade.

All butters sold on the Queensland and interstate markets is of first quality. A more reliable comparison of the efficiency of the industry in this State is obtained by a perusal of the following figures, representing the results of the grading of all butters submitted for export, together with the grading of butters for State and interstate markets, during the past year:—

Choice and first grade, 87.3 per cent.; second grade, 8.4 per cent.; third grade, 4.3 per cent.

There has been a considerable improvement in the output of our factories during recent years, while the fact that our butter factories compare more than favourably in structure, equipment, and management with similar establishments in any other part of the world is the considered opinion of many visitors to our shores who have been in a position to judge.

We realise, however, that there is still room for improvement, and we shall not feel satisfied until practically the whole of our output is of choicest quality. We realise, too, the difficulties associated with the attainment of this objective in a young country of scattered settlement and vast distances. Notwithstanding the difficulties associated with pioneering, much has been done to maintain the high quality of our products.

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

## THE GREYBACK BEETLE.

### TERMINATION OF GRUB CONDITION.

BY EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

### COMMENCEMENT OF PUPAL LIFE-CYCLE STAGE.

THE coming of July usually denotes cessation of the larval phase of this cane beetle, and the consequent final departure of all third-stage fully-grown grubs from among the cane roots to various depths below basal portions of affected stools in order to assume the pupal stage of growth.

### Appearance and Coloration of the Pupa.

The pupa of the greyback is quite the largest of those occurring in plough furrows, full-sized specimens being 1½ inches long by nearly ¾ of an inch across the widest portion, as shown in the illustration (Plate 1). Its general colour is reddish-yellow, which gradually darkens as final transformation into the adult beetle approaches.

### Ordering Grub Fumigants for the Coming Season.

Early this month canegrowers should place their orders for carbon bisulphide or paradichlorobenzene with the accountant of the sugar-mill to which their cane is assigned, the quantities asked for depending, of course, in each case on the number of acres to be treated on individual farms.

PLATE 1.—Pupa of "Greyback" Cockchafer. (Natural size.)

From £8 to £9 per acre, including labour, is usually allowed for the cost of fumigating a crop. Allowance must also be made for the sacrifice of about 6 tons of the yield of cane expected from the acre to be fumigated. Thus, if the estimated yield be 36 tons per acre, a farmer can, by means of such control work, make sure of ultimately harvesting 30 tons of good mature cane, and of saving next year's ratoon crop. On the other hand, by neglecting to fumigate he not only risks the loss of the entire 36 tons and his ratoons for the following season, but incurs an additional expense of replanting a few months later, to say nothing about the cost of his own time and labour for the past twelve months or more. The price of Dank's hand injector is about £7 5s., plus insurance, packing, &c.; if taken care of these injectors will last for years and give good service.

**Destroying Pupae of the Greyback Cockchafer.**

Laboratory experiments conducted at Meringa in August, 1921, proved conclusively that pupæ of this insect when lying in compact soil quickly succumb to fumigation with carbon bisulphide. Preliminary field tests conducted in September of the same year demonstrated that these fumes also penetrate the walls of the subterranean pupal cell of this beetle, injections made at a depth of 8 inches from the surface in ploughed ground proving fatal to pupæ lying at an average depth of 11 inches. Subsequently, in 1923, it was found that ½ oz. injections of carbon bisulphide administered on both sides of the rows of cane which had been destroyed by grubs, and placed 15 inches apart—6 inches from centre of stools and 8 inches deep—yielded excellent results on elevated cane lands which had been ploughed about 9 inches deep. Examination of infested ground twenty-four hours later revealed that the fumes had entered the pupal cells situated fully 18 inches below the surface, and in those where transformation from pupa to perfect insect had taken place had also killed the greyback beetles.

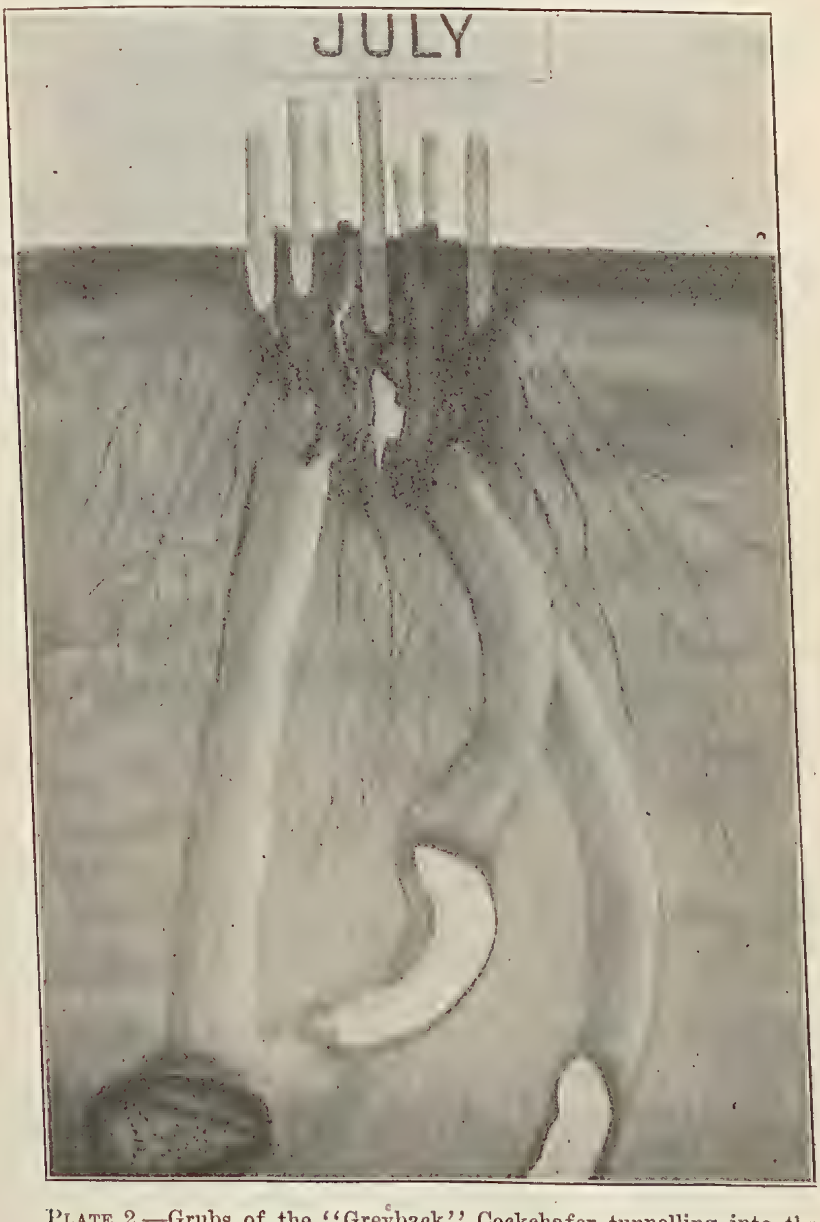


PLATE 2.—Grubs of the "Greyback" Cockchafer tunnelling into the ground to transform into pupæ.

On poor cane land that may have become badly pupa-infested, an application of carbon bisulphide, in addition to killing the pupæ and beetles of this cane pest, would help to restore primitive fertility to the soil, by destroying certain bacterial and fungoid parasites which live underground and are known to be destructive to plant life.

The plate for July indicates greyback grubs tunnelling downwards to transform into pupæ, one of which is shown at the corner of the plate. The cane stool above is throwing weak young ratoon shoots.

---

## SUGAR-CANE QUARANTINE DISTRICTS.

*Mackay.*—Sugar-cane growers and others in the Mackay district are hereby notified that under "*The Diseases in Plants Acts,* 1929 *to* 1930," the following areas were declared Sugar-cane Quarantine Districts:—

> *Proserpine and Mackay.*—The area lying between a line drawn due west through Bowen on the north, and Alligator Creek on the south.
>
> *Plane Creek.*—The area lying between Alligator Creek on the north, and a line drawn due east and west through Rockhampton on the south.

Under the provisions of the Acts, the removal of sugar-cane plants from these districts, or their introduction into these districts from outside areas, is prohibited unless a permit in writing has first been obtained. Any person desirous of obtaining such permit during the current year is accordingly requested to make application to the Director, Bureau of Sugar Experiment Stations, Brisbane, before 20th June, 1933, in order to enable the necessary inspections to be made.

*Bundaberg-Childers.*—Sugar-cane growers in the Bundaberg-Childers district are hereby notified that under "*The Diseases in Plants Acts,* 1929 *to* 1930," the following area was declared a Sugar Cane Quarantine District:—

> The area lying between a line drawn due east and west through Rockhampton on the north, and a line following the Burrum River to its junction with the North Coast Railway, near Howard, and thence due west, on the south.

Under the provisions of the Acts the removal of sugar-cane plants from these districts, or their introduction into these districts from outside areas, is prohibited unless a permit in writing has first been obtained. Any person desirous of obtaining such permit is accordingly requested to make application to the Director, Bureau of Sugar Experiment Stations, Brisbane, before 15th July, 1933, in order to enable the necessary inspections to be made.

*Maryborough-Bauple-Moreton.*—Sugar-cane growers and others in the Maryborough-Bauple-Moreton districts are hereby notified that under "*The Diseases in Plants Acts,* 1929 *to* 1930," the following areas were declared Sugar-cane Quarantine Districts:—

> *Maryborough.*—The area between a line following the Burrum River to its junction with the North Coast Railway, near Howard, and thence due west, on the north, and a line drawn due west from Hook Point (on the southernmost end of Great Sandy Island) on the south.
>
> *Moreton.*—The area lying between the southern boundary of the Maryborough district on the north, and a line drawn due east and west through Brisbane on the south.

Under the provisions of the Acts, the removal of sugar-cane plants from these districts, or their introduction into these districts from outside areas, is prohibited unless a permit in writing has first been obtained. Any person desirous of obtaining such permit during the current year is accordingly requested to make application to the Director, Bureau of Sugar Experiment Stations, Brisbane, before 15th July, 1933, in order to enable the necessary inspections to be made.

Sugar-cane growers and others are notified that owing to the presence of Fiji disease, the parishes of Maryborough, Bidwell, Tinana, Walliebum, and Young have been proclaimed a quarantine area, and no sugar-cane plants may be removed from this area unless a permit in writing has first been obtained. Any persons desirous of obtaining such permit during the current year are accordingly requested to make application to the Director, Bureau of Sugar Experiment Stations, Brisbane, before 15th July, 1933, in order to enable the necessary inspections to be made.

## Dr. KERR'S CAREER.

The appointment of Dr. H. W. Kerr to the position of Director of the Bureau of Sugar Experiment Stations, as successor to the late Mr. Harry T. Easterby, is approved generally in sugar circles. As Acting Director from time to time Dr. Kerr proved his capacity for such an important post, to which he brings an abundance of youthful energy with a brilliant academic and official career as a background. The new Director was born at Randwick, Sydney, on 18th May, 1901. He received his early education at the Central State School at Charters Towers, from which in 1914 he gained a scholarship entrance to the Ipswich Grammar School. In 1917, after obtaining an excellent pass in the Junior University examination, he entered the public service as a cadet in the laboratory of the Agricultural Chemist under Mr. J. C. Brünnich. Attending the University of Queensland as an evening student, he graduated in Science with first-class honours in Chemistry.

PLATE 3.—Dr. H. W. Kerr, M.Sc., Ph.D., Director, Bureau of Sugar Experiment Stations.

With two other brilliant young students, Messrs. Arthur Bell and Norman Bennett, he was awarded a travelling scholarship, enabling him to spend four years abroad studying agriculture and soil science and visiting the sugar-producing countries of the world as an observer of modern agricultural practice relating to every phase of cane cultivation. All three young men have since given, and are continuing to give, notable service to the Queensland sugar industry.

In the course of his period of study abroad Dr. Kerr spent two years at the University of Wisconsin in soil research work, and graduated with the degree of Doctor of Philosophy. He was Queensland delegate at the 1927 Conference of the International Society of Soil Scientists and at the Imperial Agricultural Conference in the same year. After a further course of research work at the Rothamsted Experiment Station (England), Wisconsin University (U.S.A.), Hawaiian Islands, and Java, he returned to Queensland in 1928, and was appointed Soils Chemist to the Bureau. On the reorganisation of the Bureau he assumed control of the Division of Soils and Agriculture, and has since directed all the agricultural investigation work of the Bureau, including farm experimental plots and the planning of the work of the three experimental stations—South Johnstone, Mackay, and Bundaberg.

# A New Implement—The Stubble Shaver.

By H. W. KERR.

THE comparatively unsatisfactory nature of ratoon crops in Queensland is appreciated by most canegrowers. This is particularly true for the drier areas of the State, and the irrigated Burdekin district is included in this class. Undoubtedly there are a number of causes contributing to this effect, and one of particular interest is the difficulty of keeping the stools well set in the ground. Any practice which encourages the growth of the stool in the dry surface layer of the soil will act detrimentally to the production of good ratoons. This is especially noticeable where irrigation methods involve the practice of hilling-up. In such cases it is desirable that the land surface be levelled down at ratooning time, and the development of the ratoon shoots from the bottom eyes of the stubble encouraged. Those growers in the Burdekin area who are producing profitable ratoon crops pay particular attention to this point.

Even where "level" cultivation is practised, the benefits which followed the destruction of the top eyes of the stubble are reflected in the resulting ratoons. The need for a suitable implement to enable this operation to be effected expeditiously and satisfactorily has been keenly felt, and it is appreciated that the bumper disc harrows are only partially successful in their work in this connection.

It is pleasing to announce, therefore, that an implement especially designed for the purpose has recently been imported to Queensland. It comes through the courtesy of the Onomea Sugar Company of Hawaii, who designed the implement for use on their plantations, where its results were entirely satisfactory. This "Stubble Shaver" as it is called, is being despatched to the Burdekin district, where it will be thoroughly tried out. Later, it will be transferred in turn to the chief cane districts of the State, and growers will be afforded an opportunity of studying the machine and its work.

The accompanying photograph (Plate 4) shows clearly the essential features of the implement. It is mounted on four wheels, which is a decided advantage on land of uneven surface as it allows for better control of the cutting discs. These latter are revolved about a vertical axis by a chain drive from the rear axle. The drive is thus transmitted from the two rear wheels and should ensure positive action. The discs are each 24 in. in diameter, and the depth at which they work is readily controllable by the operator, through the lever provided. In this way satisfactory work may be done on fields where the stubble is set at irregular heights or the land surface is uneven. Further, the depth below the surface at which the shaving is done will depend on the nature of the stools, which again is a function of the variety and cultural practices, as well as the soil and the nature of the crop harvested.

The implement is designed for draught by a light tractor, but it could also be adapted for horse work.

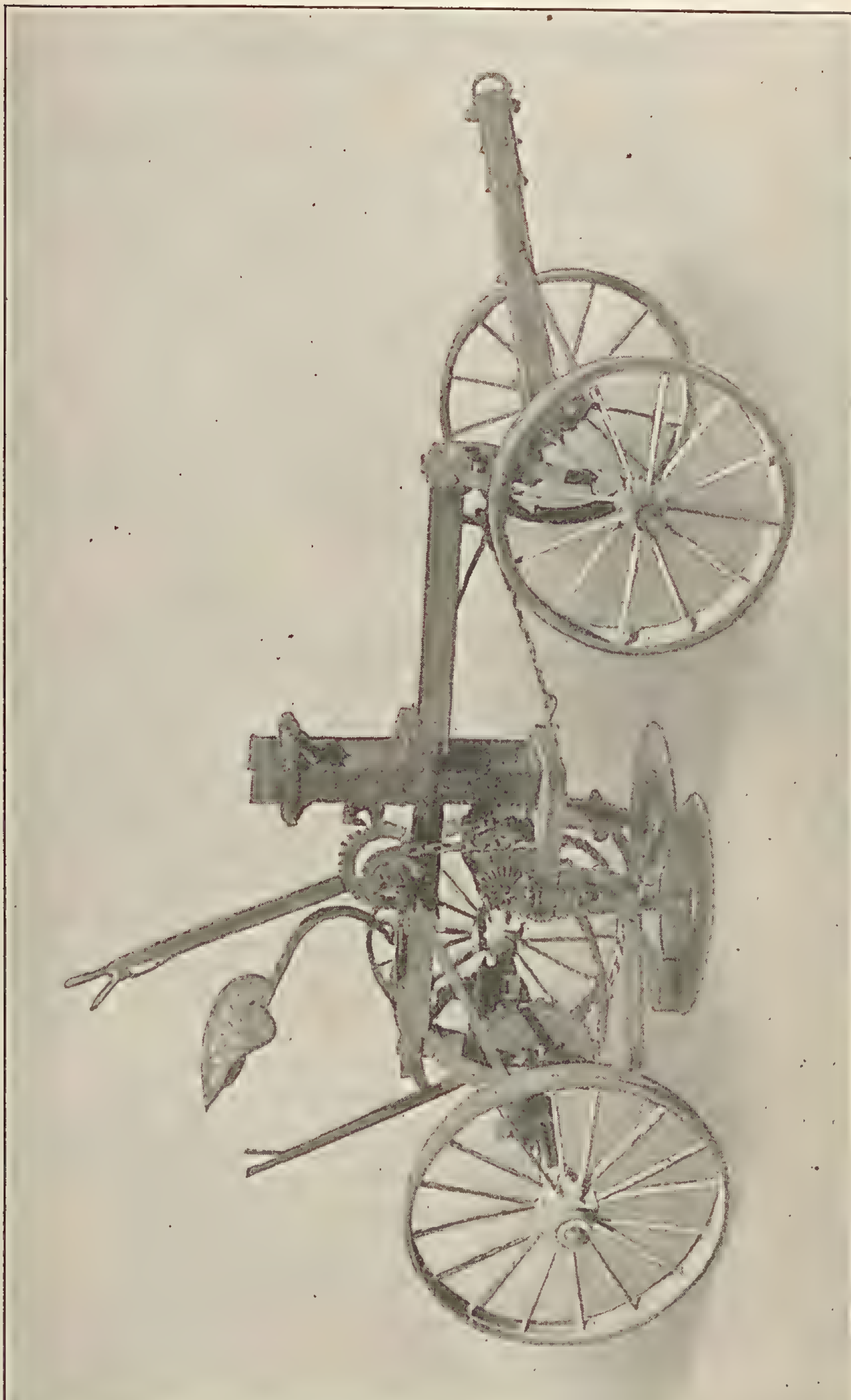

PLATE 4.—THE STUBBLE SHAVER.

# Irrigation Principles.

By H. W. KERR.*

RECENT events indicate that our sugar industry is again entering one of those troublous periods with which its history is punctuated. The present situation is largely the result of depressed times following closely on the heels of a few years of relative prosperity which saw a tremendous expansion in the area devoted to the crop. A sudden contraction in the price of locally consumed sugar, coupled with a collapse of world market values for the surplus production have created a situation which will inevitably inflict many hardships on the producer before the necessary adjustments may be made. Little hope can be held out for an improvement in the Australian price, while even the most optimistic would not hazard the forecast of an immediate recovery in world values to a level which would make it possible for the Queensland producer to compete profitably on the open market. Stability will be restored then, largely as a result of decreased production costs, and it is this aspect of the problem which will be discussed in the present paper.

In the ensuing struggle, the grower is undoubtedly faced with the most profound difficulties; and this is particularly true of the "small" farmer who employs but little labour, and to whom reduced sugar values mean a severe contraction in the family income. Any reduction in production costs, as far as he is concerned, must come entirely as a result of individual initiative, and a modification of present farming methods to ensure a return which will more than cover cultivation costs. This will be particularly difficult in those areas where a combination of depleted soils and uncertain seasons conspire to make farming a hazardous undertaking; and a careful review of the situation shows clearly that no single factor will contribute more to a successful reconstruction than to place the business of cane growing beyond the reach of climatic vagaries. A growing realisation of the truth of this observation is clearly evident throughout the central and southern areas, and one is led to the conclusion that the dawn of extensive irrigation farming is at hand.

Those members of our agricultural section who are privileged to attend the present Conference will be afforded an excellent opportunity of seeing what can be done by the judicious application of water, to enable the cane crop to maintain steady growth through those drought periods common to all cane areas. Growers in the Ayr district early realised the absolute necessity for irrigation if their lands were to realise the high productivity which their natural fertility promised. They are, therefore, able to point proudly to the distinction which their district enjoys of maintaining the highest average production of sugar per acre in Queensland. It should be clearly understood, however, that it is only during the past few years that farmers in this area have realised that keeping the crop alive by irrigation, in anticipation of the wet season's rain, is not a profitable undertaking, and results rather in an increase in production costs. Hence it will be observed that leading

* In a paper read at the Fourth Annual Conference of the Queensland Society of Sugar Cane Technologists, Ayr (Q.), March, 1933.

growers have turned their attention to the maintenance of vigorous growth by artificially applied water, and their results promise to revolutionise farm practice in the area.

This latter fact is emphasised to clear up a point which many growers are inclined to advance as a serious objection to irrigation proposals; they argue that if the added cost of irrigation will guarantee an average yield of only 20-25 tons of cane per acre, no reduction in the cost of producing a ton of cane will be effected. But on studying the returns from those farms of the district where cane is literally grown by irrigation, assisted, of course, by the application of the necessary fertilizer, it will be found that the average yield is nearer 40-45 tons per acre. Further, these returns are generally independent of the season, while the profitable increase shown from the use of artificial manures makes it possible to maintain soil fertility and thus preserve the productivity of the land. Though the latter aspect of the agricultural problem is one which our farmers would gladly forget in times of adversity, it is nevertheless true that past failure to appreciate the importance of maintaining the "working capital" of the land—its fertility—is probably contributing as much to the present reduced crops as the absence of favourable climatic conditions.

A second objection which is often raised against irrigation proposals is that of the difficulty of financing the scheme. It is agreed that this problem is a real one in many cases; but it is remarkable how many enterprising farmers have been able to provide themselves with a satisfactory water supply at very little cost. The success of the venture generally provides the means for installing more adequate equipment in the course of a few years.

Although these preliminary remarks might appear to be addressed chiefly to growers who are farming in the central and southern districts, it must be emphasised that they apply with equal force to those who are producing cane in the northern areas also, where nature is more liberal in the bestowal of her favours. During the past year a small scale irrigation trial was conducted at the South Johnstone Experiment Station, under conditions which were made as nearly as possible ideal for cane growing. It was found that the natural rainfall distribution of even the Innisfail district is quite incapable of maintaining steady cane growth, and the irrigation water applied during the growing season resulted in a tremendous increase in crop yield. Truly, the conditions of the trial referred to are not capable of realisation in farm practice, and therefore the yield per acre as calculated on the basis of the produce from this small plot (144 tons of cane per acre) is quite fictitious. But even a yield of one-half this value would be greatly in excess of the normal plant crops which are harvested from lands of this type under first-class farming methods. Considering the facilities which are so admirable for irrigation on large areas of the far North, it is most surprising that in no instance has the writer seen any pretence at exploiting these natural resources.

## IRRIGATION PROBLEMS.

For the benefit of those who are seriously considering the development of such irrigation facilities as are at their command, a few of the important inherent difficulties of irrigation practice will be pointed out, and suggestions offered for obviating such as may be

avoided. First of all, it must be realised that irrigation water differs, in general, from natural precipitation. The latter is essentially nature's own pure distilled water, until the moment it reaches the surface of the earth. Thence the surplus moisture either runs off and finds its way into natural watercourses or percolates into the depths of the porous sub-soil strata, where it may again be tapped and brought back to the surface by artificial means. The latter method provides the bulk of the irrigation water employed in the Burdekin area. Now, in the course of its passage over or through the earth, the original pure water exerts a greater or lesser solvent action on the mineral particles with which is comes in contact. It is found, moreover, that certain substances which are dissolved in this way possess properties which may render the water distinctly unsuitable for irrigation purposes, and therefore, the *quality* of the water which it is proposed to employ should first of all be determined. Of these contaminating compounds, the chief are excessive amounts of salt, and carbonate of soda. The upper limit of the concentrations of each of these substances which may be present without producing harmful effects is a matter which can be decided only after due regard has been paid to the nature of the soil on which it will be employed. When impure waters are employed, certain irrigated soils show a pronounced tendency to develop unfavourable sticky characteristics, which after a time make it very difficult to produce and maintain a condition of good tilth. In such cases the proportion of the above impurities which may be tolerated is decidedly low. On the other hand, the red volcanic soils possess the peculiar property that concentrations of even a hundred grains or more of salt per gallon may be present in the irrigation water without effecting serious damage. Of course, it must be remembered that the accumulation of salt in the soil moisture will ultimately inhibit growth due to the inability of the plant roots to absorb water under these conditions; and where the water employed is rich in salts, care must be exercised to provide for adequate sub-drainage, which will enable the soluble salt to be washed from the soil. Carbonate of soda is a particularly troublesome substance, for in concentrations of even a few grains per gallon it acts as a definite plant poison, while its effects on the soil are cumulative, and definite steps must be taken to neutralize this influence. Fortunately, this consideration of water quality may be readily cleared up by an analysis, which will be conducted free of charge for canegrowers by the Bureau. The water from our coastal streams is usually of high quality, except where tidal influences prevail; and growers can be reasonably assured that such sources will be entirely satisfactory for irrigation purposes.

### Adequacy of Supply.

The next consideration is that of the volume of available water. On more than one occasion the water-loving characteristics of sugar-cane have been emphasised. The growth of a 40-ton crop involves the absorption of practically 50-55 acre-inches of water from the soil; when allowance is made for the fact that much of the rain which falls on the land in times of heavy downpour is lost by surface run-off, a further proportion is removed from the range of the crop roots by deep percolation, and appreciable quantities are lost by evaporation from the moist land surface, probably not less than 100 acre-inches of moisture are utilised or dissipated in the process. Where

cane irrigation is contemplated in the drier areas of our State, it may be assumed that at least 40 acre-inches of water will be applied artificially per annum. In round numbers, this means 1,000,000 gallons of water per acre; or, for 40 acres of cultivation, 40 million gallons. Carrying the calculation a little further, let it be assumed that this volume of water will be applied over a period of 100 days. The average daily consumption will then be 400,000 gallons. These figures will show that it is extremely important to have access to an adequate supply of water before the project is embarked on. Where a small open flow is being drawn upon for the supply, a further important point must be observed. October and November are probably the two months of the year when irrigation water will be in greatest demand. In Queensland the spring is usually the driest period of the growing season, and, by the same token, the flow of water in natural watercourses is at its lowest ebb. In making a survey of streams of limited capacity it should, therefore, be remembered that estimates of supply must be made at this season.

### Distribution of Water.

Assuming that an adequate volume of water is available, the next consideration is the problem of its application. When natural rainfall is received by the land, the even distribution of the water is automatically taken care of; but when water is applied artificially considerable skill must be exercised in this regard. Irregularities in the land surface are frequently present to complicate the problem, and even under the most favourable circumstances the supply of water to the margin of the field where the water enters is inevitably greater than at the distant end of the water furrows. For the former problem something may be effected by judicious grading, but this is a project which must be undertaken only with the greatest care. Where the soil is shallow, the removal of even an inch or two of the surface layer might be decidedly detrimental to the fertility of the land; and grading may be effected successfully only where a good depth of surface soil is available. To prevent gross irregularities in the distribution of water as between opposite ends of a field, the remedy is to restrict the length of water furrows. The mistake is still made in some cases of attempting to run the furrows for 15 chains or more; and under these conditions it will be found that whereas the near border of the field may receive 12 inches at one watering, the distant end may get less than two. Not only does this result in a tremendous wastage of water, with the consequent addition to irrigation costs, but the danger of water-logging the soil where sub-drainage is not highly favourable may cause serious injury to both soil and crop. Where water costs are relatively low, it is considered that to effect a saving in labour by this method, is sound economy; but the wisdom of the policy is highly hypothetical.

Employment of short furrows—say, from 3 to 5 chains—will undoubtedly lead to increased demands on labour; but it is felt that careful comparison of the respective methods and the results obtained will show that the shorter furrow system is superior. The water saving which will be effected and the consequently increased speed with which the entire farm may be irrigated, will probably outweigh any advantages offered by the alternative system, without reckoning any increased value for the superior crops produced. When

pumping costs are relatively high—for example, where deep wells are employed or where the water must be raised above a high river bank—the above-mentioned conditions might be entirely reversed, and it will pay the farmer better to increase his labour costs to enable a given supply of water to be spread over a larger area.

### Need for Sub-drainage.

The danger of water-logging any soil devoted to cane-growing has been repeatedly emphasised; and under irrigation practice where the water contains a proportion of dissolved salts, the damage done is much more serious than with natural rainfall. If free sub-drainage is not provided, the accumulation of soil moisture which is slowly evaporated both by the crop and from the soil surface, may lead to a serious concentration of salt. It has already been pointed out that the crop is critically injured under these conditions.

Where the sub-soil contains a reasonable proportion of clay—and this is usually the case under conditions of poor drainage—the mole drainer may often be used to advantage. It obviates the excessive cost of tiles, which are practically the only alternative. The necessity for paying detailed attention to soil drainage is especially important for an area such as Mackay, where the alluvial lands are practically level, and of these the older types of soil possess naturally an impervious sandy clay sub-soil layer frequently associated with ironstone nodules.

### Frequency of Watering and Amount Applied.

One of the most important questions in irrigation practice is that of the frequency of water applications and the amount of water which should be applied at one irrigation. At the present time in Queensland, irrigation must be considered essentially as an *art*, in that the farmer is guided mainly by intuition in determining when a further watering is called for, and also in judging the volume which should be applied. Obviously it is highly desirable that the practice of irrigation be placed on a sound *scientific* basis. Extensive researches in this connection have been undertaken in overseas cane countries, and some of the more recent results are extremely interesting and valuable.

First of all, we should be able to determine definitely the point at which active crop growth ceases due to soil moisture deficiency. The method of carrying out this work is by making systematic growth measurements on selected cane stalks, at frequent intervals following an application of water. Where the results show that growth has practically ceased, a sample of soil representative of the area under review is taken and its moisture content determined. It is a well established fact that a given soil is capable of holding a definite percentage of moisture in its natural thoroughly-drained state in the field. Of the water held in this way, only a fixed proportion is available for the maintenance of vigorous growth, and tests show that the amount of moisture still present in the soil when growth ceases is quite appreciable. This point must be definitely understood if one of the fundamental principles of irrigation practice is to be clearly grasped. As an illustration of the order of moisture percentages measured in this way, a series of studies carried out on a red volcanic soil might be taken. The results show that this soil retains as a maximum 32 per cent. of its weight of moisture after draining,

and when the growth rate of its crop falls to a minimum, it still contains 20 per cent,; that is, moisture equal to only 12 per cent. of the weight of soil is available for the maintenance of vigorous cane growth. It is generally conceded that the crop draws the bulk of its moisture from the uppermost 3 feet of soil, and obviously the distribution of roots in this layer is not so uniform that all portions of the soil will be dried out at the same rate. A typical series of moisture studies is the following:—

1st foot of soil—22 per cent. moisture

2nd foot of soil—25 per cent. moisture.

3rd foot of soil—28 per cent. moisture.

It is now quite a simple matter to calculate the amount of water which should be applied to bring the soil back to a uniform moisture content of 32 per cent. From the above data it is found that a 3-inch irrigation would restore this particular soil exactly to that condition, while allowing no excess water to be lost by deep percolation.

The problem is not quite so simple as the foregoing remarks would indicate, and so far as the determination of the soil moisture characteristics is concerned, an extensive series of tedious tests is involved. Once the work has been completed, however, the knowledge gained is of immense value to the grower.

Nothing has been said as yet regarding the rate at which the soil loses its moisture. It is found that this factor is governed principally by (*a*) the stage of development of the crop, (*b*) the season of the year. A young plant with its restricted root and leaf development will obviously not utilise water as vigorously as one which has attained its peak of leafy growth supported by a root system which thoroughly permeates the soil. Again, temperature considerations are very important in determining the rate of crop growth, and consequently the rate of water consumption. The problem is further complicated by such factors as the degree of atmospheric humidity, incidence of winds, the soil type itself, and the same considerations also govern the rate of moisture loss by direct evaporation from the soil surface. As an instance, it might be pointed out that in the early summer months the Ayr district usually experiences high temperatures associated with strong, dry winds. Under these conditions the rate of water consumption by the crop is excessive, and the unfavourable atmospheric conditions are so distressing to the cane plant that crop growth is severely hampered. At the corresponding season in the more humid north, the rate of growth is phenomenal where soil moisture is available (see Plate 5).

As a general rule, however, it may be assumed that a young crop requires rather infrequent light waterings, while a well advanced crop will respond to heavy irrigations at ten-day intervals during the height of the growing season. It is a well established irrigation principle that at the time of planting any crop, it should be the aim of the grower to have his soil at the so-called "optimum" moisture content, and *defer* irrigation until the crop is definitely showing symptoms of soil moisture deficiency. From the time irrigation is begun, the development of the crop should be continued uninterruptedly throughout its lifetime. Serious growth checks act highly detrimentally to crop yields, and add materially to production costs.

## Time of Planting.

In attempting to follow this principle, it is obvious that the planting season will be important. Remembering again that the spring months are so frequently dry, autumn planting would appear to be most favourable in this respect. In point of fact, it has been found by experience in the Burdekin area that March-April planting usually yields the most favourable results. There is a further point which requires stressing in favour of this policy, and one which is not often appreciated. When the cane sett is planted, it yields, first of all, a primary shoot which in the course of time gives rise to secondary (and possibly tertiary) shoots which originate from the base of the original parent. This "stooling" process, as it is known, is essentially a slow one, due to the limited leaf surface of the young crop, and consequently its restricted capacity for the production of sugars and other foods essential for growth. Seeing that this stage is necessarily one of slow development, the question arises—what are the relative rates at which it proceeds for autumn and spring planted crops? Obviously, the former will be passing through this stage during the autumn, winter, and early spring months, while the latter will utilise the spring and early summer months for the purpose.

Some interesting facts in this regard are afforded by the small irrigation trial carried out at South Johnstone. The growth rate measurements which were made on this crop at three-day intervals showed that the April planted cane germinated more rapidly and maintained its early growth at a greater rate than that for the August planted cane, for a period of about ten weeks after planting. Thereafter the August plant cane showed an accelerated growth rate, and at exactly five months after planting the two crops showed the same stage of development. That is, the April crop had attained this point in September, while the later crop had not attained its peak of leaf development until January. As a result, the former showed millable cane in November, and during the month of December, with its long, hot days, showed a greater rate of cane production than during any other period of its life. This point is clearly shown in the diagram for the April plant (Plate 4). The spring planted crop, on the other hand, did not produce millable cane until mid-January, and the more favourable early summer months were entirely lost in this respect.

Under the climatic factors which prevailed for that particular year, at least, there can be no doubt that the autumn planted crop was vastly superior to that which was planted in the spring, provided soil moisture conditions were at all times favourable. It is probable that similar results would also be experienced in most of the cane areas of the State under adequate irrigation, with the exception that in the southern districts February-March planting would be substituted for April. Modification of the plan would be necessary, of course, if excessive rainfall during these months were to render planting impracticable.

## Position of Water Furrows.

The position occupied by the water furrow is a matter of considerable importance. It is the usual practice in the Burdekin area to utilise the planting drill for the purpose, so long as this is available. But the light cultivation which is essential, after watering,

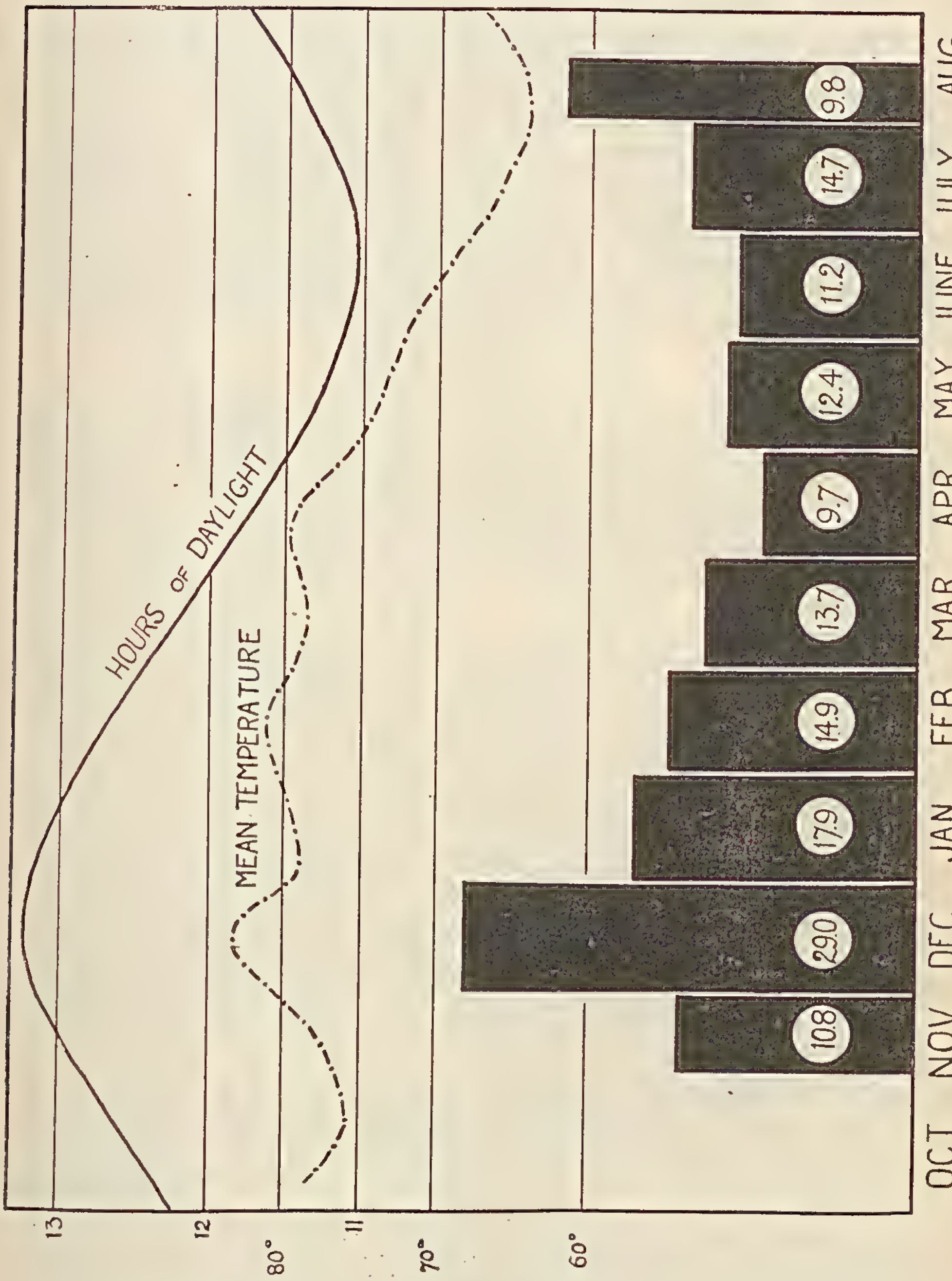


PLATE 5.

The solid blocks represent the tons of cane per acre produced under optimum conditions during each calendar month. The curves for hours of daylight and mean temperature fit very well with the growth rate, and show the particularly favourable growth conditions of December, provided that moisture and plant food are available.

to restore the good tilth of the soil, control weeds, and create a surface mulch, results in a filling of the cane drill. This is often accelerated, in fact, in order to smother the heavy weed growth in the drill and avoid costly chipping. Thereafter, special water furrows are prepared prior to each watering. These are run at varying distances from the cane, but usually occupy the middle of the interspace. This is, undoubtedly not in the best interest of economical utilisation of water. For to bring about a complete wetting of the soil mass occupied by the cane roots—and this area spreads in the form of a cone below the sett—it is assumed that lateral water movement will be effective. That this movement is slow and incomplete is a well established fact, and the desired result may be realised only by the application of excessive amounts of water, with the attendant difficulties already discussed.

### Ratooning Problems.

Undoubtedly, this is a problem which deserves closer study, and every effort should be made to keep the cane furrow open as long as possible. Interspace water furrows also result in the hilling up of the cane, which, though not detrimental to the yield of the plant crop, introduces a serious obstacle to successful ratooning. The fact that so few profitable ratoon crops were produced in this area for many years provides definite evidence of the weaknesses of the prevailing practice. Recently, however, the ratooning problem has been attacked with a considerable measure of success. It was found that to produce heavy first ratoon crops it is necessary to make an application of water and fertilizer to the stools as soon as possible after harvesting the plant crop. To get the water to the stool and also to ensure that the ratoon shoots will be well set in the ground instead of on the surface of the dry hill, the first step taken is to level the field down by the use of bumper disc harrows, or sometimes the rotary hoe. Probably a suitably constructed stubble shaver would be even more effective. Naturally, the ratoons will need irrigation and cultivation just as much as did the plant crop, and with respect to fertilizer applications, considerably more so. In the Burdekin area, it has been demonstrated conclusively that heavy dressings of sulphate of ammonia have a profound influence on ratoon yields; while in other areas, where the soils are not so richly provided with available phosphates and potash as are these, heavy applications of general manures will be necessary in addition.

In this connection it must be emphasised that irrigation alone will not ensure satisfactory crops on depleted soils. Plant food and water are equally instrumental, and, indeed, with the harvesting of the heavier crops which will naturally be sought, this point is of paramount importance. As a general guide it may be assumed that to replace the plant food removed from the soil by 1 ton of cane, about 25 lb. of mixed fertilizer must be applied to the land. Thus a 40-ton crop robs the soil of the equivalent of 1,000 lb. of fertilizer per acre, and few, if any, of our cane lands are capable of standing up to this treatment for any period of years without suffering a tremendous reduction in their fertility and productivity.

In passing, it should be mentioned that a recent innovation in ratooning procedure in the Ayr district appears to offer a simple and effective method of ratoon irrigation which will be highly economical on water. This is a most important aspect of the problem for in general

the pumping plants which are in operation are not competent to deliver the water necessary at peak periods to enable both plant cane and ratoons to receive the full supply they require, *when* they require it. The essentials of the method are as follows:—

The initial discing is carried out as outlined above, and the early waterings are given in the usual manner, by creating the customary interspace water furrows. With subsequent cultivation a certain amount of "hilling up" is inevitably brought about; but prior to the last watering after which the crop will be out of hand, a 10-inch swing plough is used to produce a furrow about 6 inches deep, close to one side of the cane row. This operation is usually completed in December, and thereafter this is employed as the watter furrow, no subsequent cultivation being given. The essential effects of the operation are shown by the accompanying sketches (Plate 6).

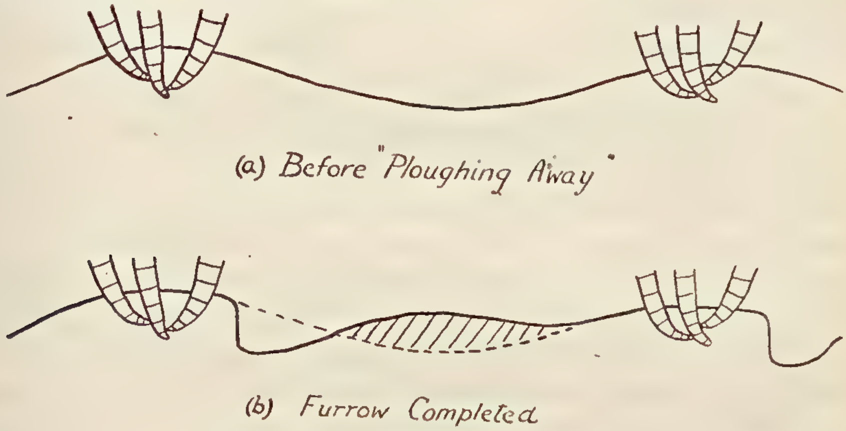


PLATE 6.

To facilitate tramming, each twentieth line remains untreated.

The advantages claimed for the method are that cane covers in much more rapidly than is the case with the customary practice, probably due to the fact that the water is applied in closer proximity to the point where it is required. For the same reason, the policy is more economical on water, and this enables an irrigation round to be completed in quicker time. Finally, excessive flooding is avoided, so that much of the soil surface remains dry, it retains its condition of good tilth, evaporation losses are reduced, and weed growth is inhibited. The modification should certainly appeal to canegrowers practising irrigation, and the final verdict on its practicability will be awaited with interest.

**Conclusion.**

So much for a brief outline of certain of the fundamental principles of irrigation. Undoubtedly numerous other questions are in the grower's mind, particularly those on the practical side regarding the installation of suitable equipment, laying out of main supply ditches and laterals, the utilisation of fluming, and so forth. While regretting that this aspect of the problem cannot be dealt with at present, it should be added that there is no better way of acquiring information on these important considerations than by visiting the Burdekin area. Here visitors may be assured that every assistance will be afforded them in obviating many of the practical errors into which pioneers in this field are inevitably drawn.

# Termites (White Ants)

By J. A. WEDDELL, Assistant Entomologist.

ALTHOUGH because of common usage the name "white ants" is included in the title of this article, the insects so called are not true ants. They differ markedly from them in many important structural details, and are widely separated in the system of classification of insects. For these reasons it is preferable to use a more accurate common name, and throughout these notes the name "termites" will be used in the hope that it will become more generally adopted.

## Importance.

Termites of various species occur in practically all tropical and sub-tropical areas throughout the world, and they are responsible for a tremendous amount of damage annually. In a country such as Australia it is hardly necessary to stress the importance of termites and the degree of damage of which they are capable; and less so in Queensland, where so many homes and other buildings are constructed mainly of timber, and where the risks are fairly generally known. Telephone, telegraph, and electric light poles, fencing posts, railway sleepers, and timber road and railway bridges are also liable to damage, hence the seriousness of the pest in a country of great distances may be quickly realised. Living trees, including forest, fruit, and shade trees, sugar-cane, garden plants, and vegetables, have all been found to suffer at times from termite infestation, and various stored materials such as books, papers, clothing, leather, horn, bone, sugar, and wheat have also been damaged. Perhaps the most surprising fact is that termites may penetrate such apparently safe materials as weak cement and lead sheathing, presumably in exploration for suitable food. Instances are known wherein the operations of the termites in boring into the lead sheathing of underground electrical cables have allowed the entry of moisture, and thus interrupted either power transmission or telephonic communication.

## Life History and Habits.

(*a*) *Mound-building Species.*—Termites are essentially social insects; that is, they dwell in colonies such as are exampled by the honey bee and the true ants. The most commonly known group of termites is that comprising the mound-building species. The familiar mounds are honeycombed with galleries (Plate 7, fig. 1), which extend also below ground a considerable distance. Generally at about ground level in the centre of the termitarium, as it is called, will be found a larger chamber in which there usually is lodged a distended-looking insect possibly anything up to an inch in length. This is the queen mother of the colony. She is practically an egg-laying machine. The queen is fed by the workers, who also take away and tend the eggs that are laid. The workers are the familiar insects commonly found in damaged timber, and they are responsible for the damage (Plate 7, fig. 2). Also present in the termitarium is found another form of the insect with very large, brown heads and prominent mandibles or jaws, aptly termed the soldier caste. The function of the workers is to build the termitarium, gather food, feed the colony, and tend the eggs and young. The soldier caste protects the colony from attack by other insects. Numbers of the soldiers will often crowd to a broken opening into the termitarium and temporarily close it with their large heads, aggressive jaws turned outwards, until the workers are able to reseal the break.

Both the soldier and the worker caste are sterile, but at certain times in the year—determined by the species, usually in the warmer months—a generation of winged male and female termites is produced in the colony, and on a selected day a dense flight of this caste of the insects is released. The insects are not strong fliers and do not travel far. Their wings are peculiar in that after this short flight they detach at a suture close to the body, and the insects are then able only to crawl. The mating pairs wander in search of suitable colonising sites, but from a swarming flight only a few will actually become established. A surviving female from such a flight becomes the queen mother of a new colony. From a small first generation of workers she gradually builds up the army of workers and soldiers comprising a colony, with occasional swarms of winged males and females which leave the colony in the attempt to found new sites.

(*b*) *Soil-frequenting Termites and Dry-wood Termites.*—As well as the mound-building species of termites there also are species that inhabit the soil, primarily under logs, but which never form a raised mound. Again there are species, known as dry-wood termites, which need no contact with the ground whatever. Under natural conditions the flight caste of the dry-wood termite makes its entry into a dead or broken branch of a tree and there may form a nest high above the ground. In buildings it may similarly attack the rafters. The seemingly inexplicable isolated infestations, high above ground level, can thus be understood.

The workers of all the species of termites make long exploratory galleries in search of food, far from the main termitarium. Whenever it becomes necessary for them to cross an open space a covered runway of soil or chewed wood particles is formed, as termites will not work in the open.

It will be gathered from the foregoing that infestation of structures can occur only in two ways—either by the extension of the galleries of a neighbouring existing colony, or by a new infestation following a flight of winged males and females. A few workers alone are incapable of establishing a permanent nest owing to the absence of a fertile breeding insect.

### Peculiarity of Digestive Processes.

The principal ingredient of the food of termites is cellulose tissue, which is really the foundation material on which plant structures are built, and in its lignified form it is the main constituent of timber. In itself cellulose is most indigestible by termites. Inhabiting the alimentary tract of the termite, however, are minute organisms known as protozoa, and when the masticated cellulose tissue is swallowed the minute protozoa feed on it and break it down. The resultant product of their action is a material that is digestible by the termites. Here we have a wonderful example of the inter-dependence of two organisms. The termite would quickly starve to death if the cellulose tissue were not rendered digestible by the protozoa; on the other hand the digestive tract of the termite provides lodging and contains the food for the other organism. The young termite is infested with protozoa in the process of its early feeding, and the breeding of these organisms ensures a continuous population throughout the life of the termite.

### Control of Mound-building Termites Infesting Structures.

The control of infestation by mound-building termites in timber structures may be considered from the two aspects of preventive treatment and remedial treatment.

### PREVENTIVE TREATMENT.

All timber that needs to be placed in the ground should be treated with creosote oil. This material may be painted on to the timber, soaked into it by immersion, preferably with heating, or it may be impregnated under pressure. The success of the treatment and the period for which protection will be realised depends on the degree of penetration of the creosote oil. The success to be attained is thus linked with the cost that the particular building operation will afford. A good practical method of treatment of fencing posts has recently been elaborated by Federal investigators. This consists of standing the fencing posts in empty 40-gallon oil drums, from which one end has been cut. The drum is then almost filled with a mixture consisting of two parts of creosote oil to one part of crude or fuel oil by volume. The whole of the below-ground portion of the posts will thus receive treatment. The posts may then either be left standing in the creosote oil overnight, or the drums may be heated carefully over a fire to a temperature of not more than 210 deg. F. The posts in the latter instance need immersion in the heated oil for not more than four hours. Obviously the degree of penetration obtainable will depend on the dryness of the timber, and for this reason it is advisable to accumulate the timber some time before it is needed and stack it in loose piles, with alternate layers crossing, so that it dries out satisfactorily.

Building sites should be cleared of any stumps or old timber. The supports of buildings should preferably be composed of termite-proof materials such as cement or brick. Wooden house supports are, however, the most commonly used in Queensland on account of initial costs. These house stumps should be heavily treated with creosote oil. The galvanised iron stump cap with its overlapping flange is a most essential precaution for the protection of the main building. The caps should on no account be broken or punctured. Unprotected timber contacts should not be made between the stumps and the main building. Roughly-built rooms beneath wooden houses are often responsible for overhead termite infestation, and dense vines allowed to grow on the side walls would similarly provide the necessary coverage and contact. Such sources of infestation should be removed.

### REMEDIAL TREATMENT.

With regard to remedial treatment, it is, first of all, necessary to determine the extent of the infestation and the actual points of entry into the structure. The covered runways on the supports should be searched for and broken. The extent of the damage may be determined by tapping out the weakened timber. Badly damaged and weakened stumps should be replaced, and the new stumps and the surrounding soil drenched with creosote. Lightly infested stumps should be trimmed back to the sound timber and similarly drenched with creosote. The same operations should be carried out in the main building—that is, the removal and replacement of the heavily damaged timber and treatment of the lightly infested. Kerosene may be used as a drench where creosote would be unsatisfactory, as it must be remembered that creosote darkly stains timber to which it is applied.

Arsenical powders may be injected into the channels in lightly infested timbers, as will be explained when dealing with dry-wood termites.

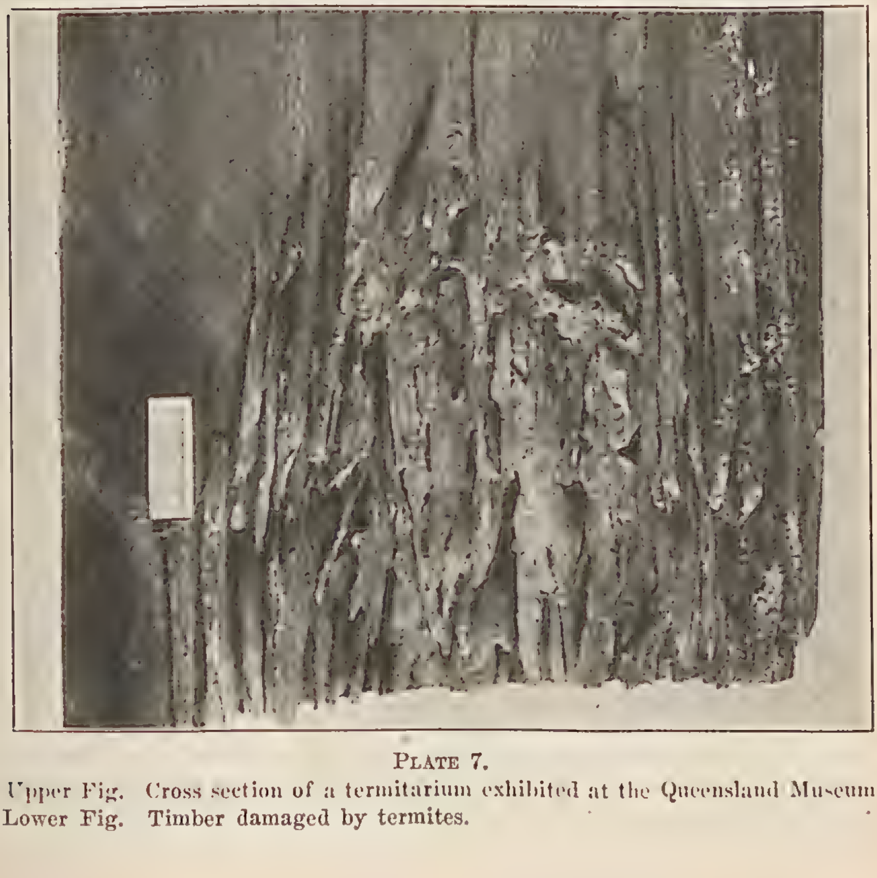

PLATE 7.
Upper Fig. Cross section of a termitarium exhibited at the Queensland Museum.
Lower Fig. Timber damaged by termites.

It may be gathered from the preceding discussion, however, that an important action is to destroy the covered runways which connect the overhead channels with the termitarium.

## Control of Dry-wood Termites.

The dry-wood termite infesting timber structures will need different treatment, as there are not necessarily in this instance convenient external runways to serve doubly as a warning and as a means of control. The presence of fine brown pellets beneath rafters is often the first indication of damage. Weakened structures should be replaced. The lightly damaged timbers may be cleansed by injecting dry white arsenic or Paris green, which is another arsenical poison. Holes should be bored at intervals, gauging them to end in the tunnels, and the dry dust should be injected with a bulb blower or a small dust gun. The control depends for its action on the habit of the termites of grooming each other of the very small particles that have caught on the fine hairs which somewhat sparsely cover their bodies. In this way the poison which is picked up from the walls of the tunnels by the passage of the insects is gradually distributed throughout the colony.

## Control of Termites Affecting Trees and other Plants.

Termites in the soil affecting trees, vegetables, and other plants may be treated either by poisoning or by fumigation.

Poison baits may be laid at intervals in the soil consisting of soft pine boards thickly smeared with a poison mixture. The formula is as follows:—Add 4½ lb. molasses or treacle and 1¼ lb. sugar to a solution of ¼ lb. sodium arsenite in half a pint of boiling water. Boards thickly smeared should be tied together in pairs with the poison between and buried in the infested soil, care being taken that the treated boards are not placed in close proximity to living roots. Naturally, results will be a little slow from this method.

Trees infested with termites should be treated in much the same manner as was described for the dry-wood termites—that is, a small hole should be bored to reach the tunnels and a small quantity of Paris green should be blown in. This method was suggested by a Federal entomologist. White arsenic is unsuitable for the treatment of trees owing to its greater solubility.

Alternatively a material known as paradichlorobenzene may be used as a soil fumigant. Paradichlorobenzene is a white crystalline substance which volatilises after the manner of naphthalene, giving off fumes that are noxious to insects. A circular trench should be dug around the trunk of an infested tree 3 to 4 inches deep and not closer than 6 inches to the trunk. Small crystals of paradichlorobenzene should be sprinkled in the trench and the soil then filled in. Care should be taken not to place the chemical in contact with any roots that may become exposed. For young trees in a very weakened condition the safe dose would be half an ounce of the crystals, and the treatment should be repeated at intervals of about six weeks. Stronger trees may receive one ounce, while up to two ounces may be applied to well-established trees that may be infested.

In garden beds already planted shallow trenches may be dug 4 inches deep and not closer than 6 inches to the row of growing plants. Paradichlorobenzene at the rate of half an ounce to each 18 inches of trench should be spread, and the earth then filled in and firmed.

# Codling Moth Control Experiments, 1930-33.

By HUBERT JARVIS, Entomological Branch.

DURING recent years a number of experiments have been conducted in the Stanthorpe district for the control of codling moth.

The experiments were as follows:—

A.—Control by non-arsenical sprays.

B.—Control by chemically-treated bandages.

C.—Control by trapping with molasses bait.

D.—Control by dusting or spraying.

Interesting results have been obtained in these four experiments, and it has been thought desirable to place them on record for the benefit of growers.

## A.—CONTROL BY NON-ARSENICAL SPRAYS.

Because of its efficiency arsenate of lead is more widely advocated than any other insecticide for the control of codling moth, but during the last few years objection has been taken to this chemical owing to its poisonous nature, for it has been proved that apples sprayed with arsenate of lead during their growth may retain traces of the poison when the fruit is sold in the markets, thus giving rise to criticism by the health authorities. This criticism can to a large extent be obviated if the apples are carefully cleaned before packing, but this is a laborious process involving much loss of time.

The justification or otherwise of this criticism is a much discussed point, but the fact remains that the use of arsenic in any form for the control of pests affecting a crop that is used for human consumption is becoming increasingly unpopular. Thus the finding of a satisfactory substitute for arsenate of lead has been engaging the attention of entomologists and others interested for some considerable time, and several chemical combinations have been formulated which have given more or less promising results.

The experiment detailed in this report was carried out during the season 1932-33, and is a further contribution towards the efforts already made to discover a really efficient spray of a more or less non-poisonous nature for the control of codling moth.

### The Experimental Plot.

The plot comprised five rows of apple trees, there being four trees in each row; four of the rows were Jonathan apples, the fifth being Vanderpool Red.

The trees were all young, being from five to six years old, and the crop was therefore small, especially on the five-year-old trees.

## Materials Used and Mode of Application.

The five rows were treated with five separate sprays, in the following order:—

Row No. 1, barium fluosilicate;
Row No. 2, arsenate of lead;
Row No. 3, nicotine sulphate-white oil;
Row No. 4, katakilla-white oil;
Row No. 5, white oil alone.

Four treatments were given in each case, and the spray was applied with a knapsack spray outfit of 4 gallons capacity. Approximately three-quarters to a gallon of spray fluid was used for each tree at each application. For a small tree this was a generous allowance, and permitted of a very thorough covering of all parts of the tree.

Barium fluosilicate was used at a strength of 1 lb. to 40 gallons, arsenate of lead at 2 lb. to 40 gallons for the calyx spray, and 1 lb. to 40 gallons for the three following sprays. The nicotine sulphate-white oil mixture was used with nicotine sulphate at a strength of 1-640, and the white oil at a strength of 1-80. In the case of the katakilla-white oil mixture, katakilla was used at a strength of 2 lb. to 32 gallons, and the white oil at a strength of 1-80. White oil alone was used at a 1-64 strength.

The cost figures of katakilla, nicotine sulphate, and white oil are based on the local prices charged for these materials. In the case of the barium fluosilicate the price is not available, because only small experimental samples have been imported.

## Seasonal Incidence of Codling Moth in the Stanthorpe District.

The codling moth infestation from the first brood was not heavy in any orchard, but there was a notable increase towards the latter end of the season, more especially in neglected orchards, and as the fruit crop throughout the district was exceptionally heavy and spraying was sometimes omitted, losses from codling moth damage in the later maturing apples were more than usually severe.

## Weather Conditions.

The season was ideal for the setting and development of fruit, and the rainfall, as will be seen from Table I., was not excessive. Fairly hot weather was experienced during December and January, and a small quantity of fruit exposed directly to the sun's rays was slightly scorched.

TABLE I.

*Stanthorpe Rainfall*, 1932-33.

| | |
|---|---|
| October, 1932 | 248 points |
| November, 1932 | 310 points |
| December, 1932 | 310 points |
| January, 1933 | 752 points |
| February, 1933 | 133 points* |

*The February rainfall occurred after the fruit was removed.

All the sprays were applied during sunny weather.

### Results Obtained.

The results obtained and tabulated in Tables II. and III. would appear to justify further experimental work with the sprays used, especially the white oil alone which, as well as being equally as efficient as arsenate of lead, was also reasonably cheap.

Nicotine sulphate-white oil and katakilla-white oil gave equally good results, and both were slightly more efficient than arsenate of lead but were very much more expensive. However, it is possible that the strength of these two sprays might be reduced, and three applications given instead of four.

Barium fluosilicate, although giving the least satisfactory control, nevertheless proved 92·8 per cent. efficient.

Both fruit and leaves on the trees treated with the sprays containing white oil were particularly clean, the leaves being a good healthy green and the fruit a bright attractive colour.

On the data secured there is a definite indication that the use of arsenate of lead may not be essential in controlling codling moth.

TABLE II.

DATE AND COST OF APPLICATION OF CODLING MOTH SPRAYS.

| Date of Application. | No. of Trees Treated. | Materials Used and Strength. | Quantity Insecticide Used in ounces. | Quantity Spray Fluid in Gallons. | Cost per Application. | Total Cost. |
|---|---|---|---|---|---|---|
| | | | | | s. d. | s. d. |
| 1932. | | | | | | |
| 4 Nov. | 4 | Barium Fluosilicate, 1 lb. to 40 galls. | 1½ | 4 | Not available | |
| 21 Nov. | | | 1½ | 4 | | |
| 9 Dec. | | | 1½ | 4 | | |
| 1933. | | | | | | |
| 9 Jan. | | | 1½ | 4 | | |
| 1932. | | | | | | |
| 4 Nov. | 4 | Arsenate of lead ; calyx spray 2 lb. to 40 galls. cover sprays 1 lb. to 40 galls. | 3 | 4 | 0 4 | 0 10 |
| 21 Nov. | | | 1½ | 4 | 0 2 | |
| 9 Dec. | | | 1½ | 4 | 0 2 | |
| 1933. | | | | | | |
| 9 Jan. | | | 1½ | 4 | 0 2 | |
| 1932. | | | | | | |
| 4 Nov. | 4 | Nicotine sulphate-white oil ; nicotine sulphate 1·640, white oil 1·80 | Nicotine sulphate 1 oz., white oil 8 oz. each application. | 4 | 0 10 | 3 4 |
| 21 Nov. | | | | 4 | | |
| 9 Dec. | | | | 4 | | |
| 1933. | | | | | | |
| 9 Jan. | | | | 4 | | |
| 1932. | | | | | | |
| 4 Nov. | 4 | Katakilla-white oil ; katakilla 2 lb. to 32 galls., white oil, 1·80 | Katakilla 4 oz., white oil, 8 oz. each application. | 4 | 0 11½ | 3 10 |
| 21 Nov. | | | | 4 | | |
| 9 Dec. | | | | 4 | | |
| 1933. | | | | | | |
| 9 Jan. | | | | 4 | | |
| 1932. | | | | | | |
| 4 Nov. | 4 | White oil 1·64 .. | 10 | 4 | 0 5 | 1 8 |
| 21 Nov. | | | 10 | 4 | | |
| 9 Dec. | | | 10 | 4 | | |
| 1933. | | | | | | |
| 9 Jan. | | | 10 | 4 | | |

TABLE III.

CODLING MOTH INFESTATION AT TIME OF PICKING.

| Treatment. | Total, Number Apples. | Sound. | Per Cent. | Unsound. | Per Cent. | Codling Moth Infested Apples. | Other Causes. |
|---|---|---|---|---|---|---|---|
| Barium Fluosilicate | 1,400 | 1,299 | 92·8 | 101 | 7·2 | 101 | 0 |
| Arsenate of Lead.. | 1,300 | 1,265 | 97·3 | 35 | 2·7 | 35 | 0 |
| Nicotine sulphate-White Oil | 950 | 933 | 98·2 | 17 | 1·8 | 17 | 0 |
| Katakilla-White Oil | 700 | 687 | 98·1 | 13 | 1·9 | 13 | 0 |
| White Oil .. .. | 800 | 782 | 97·8 | 18 | 2·2 | 18 | 0 |

### Acknowledgment.

Thanks are due to Mr. Pfrunder, of Applethorpe, who made available the plot for the work and kept it in good condition.

## B.—CONTROL BY CHEMICALLY-TREATED BANDAGES.

Bandaging the trees in order to trap the grub of the codling moth was one of the earliest control measures practised, and it is still advocated in all countries where a control of this pest is desired. This practice involves a considerable call on the time of the orchardist, as the bandages have to be examined and all grubs found in them destroyed at least every ten days, and to find time to do this during the fruit season is no easy matter. Thus this method of control has latterly fallen into disfavour, as it is recognised that unless the bandages are regularly examined they only encourage the increase of the pest. Hence the necessity of treating the bandages with some substance which would prove fatal to the grubs without repelling them and would yet be harmless to the trees was realised, and during the last few years a good deal of experimental work has been done along these lines.

In 1927 Dr. Seigler and his associates perfected a bandage meeting all the necessary requirements, and it was decided to test this chemically-treated bandage under Stanthorpe conditions. This experiment was carried out during the 1932-33 season.

### Preparation of Chemically-treated Bandages.

The bandages used in this experiment were prepared by dipping strips of corrugated paper in a solution of beta-naphthol and kerosene in the proportion of 1 lb. of beta-naphthol to 1 quart of kerosene. Corrugated paper was used, as it has proved to be far more attractive to the grubs than any other type of bandage. The paper was cut into strips about 5 feet long and 4 inches wide, this being found a convenient length to handle. The kerosene was first heated in a kerosene tin, and the beta-naphthol then added and stirred with a stick until dissolved. When the mixture was smoking hot the strips of corrugated paper were immersed in the liquid and drawn quickly through it, and an even coating of the chemical was thus obtained. When treated the strips were

hung over a line to dry, this process taking about fifteen to twenty minutes. In preparing the bandages it is important to carry out the operation well away from the house, as the hot mixture is very inflammable, and it is advisable to have only just sufficient fire under the tin to keep the mixture reasonably hot.

## Orchard Experiment.

The bandages described in the preceding paragraphs were used in Mr. P. Pfrunder's orchard at Applethorpe, and were placed on the trees on 5th and 6th December. The results obtained are shown in Table IV.

TABLE IV.

RESULTS OBTAINED WITH TREATED AND UNTREATED BANDAGES.

| Plot No. | Date Bandages placed in Position. | No. of Trees Bandaged. | No. of Bandages Used. | Date Bandages Examined. | No. of Codling Moth Grubs Found. | No. Dead. | Per Cent. Dead. | No. Alive. | Per Cent. Alive. | No. of Moths Emerged. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5–12–32 | *10 | 10 | 1–5–33 | 42 | 33 | 78·6 | 9 | 21·4 | 3 |
| 1 | 5–12–32 | †10 | 10 | 1–5–33 | 15 | 2 | 13·3 | 13 | 86·7 | 12 |
| 2 | 6–12–32 | *3 | 12 | 2–5–33 | 175 | 165 | 94·2 | 10 | 5·8 | 7 |
| 2 | 6–12–32 | †2 | 5 | 2–5–33 | 30 | 4 | 13·3 | 26 | 86·7 | 14 |

* With treated bandages † With untreated bandages.

Plot No. 1 comprised twenty young apple trees, and on these alternate treated and untreated bandages were used, one to each tree, thus making ten treated bandages and ten untreated bandages. Plot No. 2 comprised five old apple trees, three of which received treated bandages and two untreated bandages. Owing to the size of these trees it was found necessary to use from two to four bandages per tree, one being placed around the trunk and one on each main leader. All bandages had an overlap of from 1½ to 2 inches, and were kept in position by string tied firmly around the top and bottom of the bandage.

Excellent results were obtained in both plots with the treated bandages, which gave respectively a 78·6 and a 94·2 per cent. mortality, as against 13·3 and 13·3 per cent. mortality in the case of the untreated bandages.

The bandages were removed from the orchard on the 7th February, 1933, by which time all the fruit had been harvested. The bandages were then placed in breeding cages in order to check the possible emergence of codling moth until 1st May, when they were examined and a count made of the living and dead grubs and moths. It was found necessary to take the bandages entirely to pieces, as the grubs had in most instances penetrated under the corrugations.

The great majority of grubs in the treated bandages had perished before reaching pupation, and were black and shrivelled in appearance, probably dying a few weeks after entering the bandage.

## C.—CONTROL BY TRAPPING WITH MOLASSES BAIT.

During recent years considerable interest has been taken in the trapping of codling moth by means of attractive baits or lures as a supplementary measure for the control of this pest, and experiments carried out in America and in Australia have given very encouraging results in many instances.

In 1924 preliminary trials were carried out in the Stanthorpe district with fermented apple juice and vinegar solutions, but the weather conditions then experienced operated against the experiment, which was only on a very small scale. Few codling moths were trapped, but large numbers of army worm moths were caught, the commonest species being *Cirphis unipuncta* Haw. During the 1930-31 season further work was done in this direction, using molasses baits for this experiment.

### Nature of the Experiment.

A bait composed of one part of crude molasses to sixteen parts of water was used for this experiment. Altogether twenty traps were used, twelve being in one orchard and eight in another in the Applethorpe and Summit districts respectively. The traps used were the ordinary two-quart enamel pudding basins, and they were hung in the trees by wire supports fastened around the lip of the basin. In one orchard the traps were hung on light poles about 14 feet long, which enabled the traps to be placed about on a level with the top of the trees. This was done, as it had been claimed that traps so placed caught more codling moth than those placed lower down in the trees, and this proved to be the case. Evaporation, however, was much more rapid in the traps on poles, and occasionally some of the traps so placed dried out when more than a week elapsed between setting. Usually the traps were examined and reset weekly. About one pint of fluid was used to each trap. A count was kept of all codling moths, the sexes being separated, and also of some of the more important miscellaneous insects caught in the traps. The weather throughout the period of the experiment was dry and hot, with occasional heavy wind and rain storms.

### Insects Caught in the Bait.

Full details of the insects caught in the bait will be found in Tables V. and VI. These details show that in orchard No. 1, 212 codling moths were trapped, while in orchard No. 2 the tally was 180. Table VI. gives the details of the insects other than codling moths that were obtained in the traps.

The moths referred to in Table VI. belonged to the following species:—The army worm (*Cirphis unipuncta* Haw.), the corn ear worm (*Heliothis obsoleta* F.), the brown cutworm (*Euxoa radians* Guen.), and two other Noctuids—namely, *Prodenia litura* F. and *Agrotis spina* Guen., the first two being the most abundant. They reached their maximum abundance during November in both orchards.

The bugs trapped were all a fruit-spotting species of the genus *Dysdercus*, and they were very abundant in the orchards during mid and late season, causing some damage to apples. The Melolonthid beetles were all of the genus *Heteronyx*, common foliage feeders, and sometimes were very abundant in the orchards at night. Many flies (*Syrphidæ*, *Phoridæ*, *Muscidæ*, &c., wasps, lace wings, butterflies, and a host of small moths comprising many species were also trapped.

TABLE V.

CODLING MOTHS TRAPPED IN MOLASSES BAIT.

*Orchard No. 1.*

| Date of Examination. | Number Moths Trapped. | Number Males. | Number Females. | Number Traps. |
|---|---|---|---|---|
| 1930. | | | | |
| 15 October .. .. .. .. | 8 | 4 | 4 | 12 |
| 17 October .. .. .. .. | 9 | 2 | 7 | 12 |
| 23 October .. .. .. .. | 32 | 10 | 22 | 12 |
| 30 October .. .. .. .. | 12 | 4 | 8 | 12 |
| 10 November .. .. .. .. | 5 | 1 | 4 | 12 |
| 18 November .. .. .. .. | 20 | 8 | 12 | 12 |
| 28 November .. .. .. .. | 8 | 2 | 6 | 12 |
| 9 December .. .. .. .. | 9 | 0 | 9 | 12 |
| 23 December .. .. .. .. | 50 | 13 | 37 | 12 |
| 30 December .. .. .. .. | 12 | 1 | 11 | 12 |
| 7 January .. .. .. .. | 17 | 8 | 9 | 12 |
| 13 January .. .. .. .. | 16 | 2 | 14 | 12 |
| 1931. | | | | |
| 20 January .. .. .. .. | 12 | 0 | 12 | 12 |
| 28 January .. .. .. .. | 1 | 0 | 1 | 12 |
| 16 February .. .. .. .. | 1 | 1 | 0 | 12 |
| Totals .. .. .. | 212 | 56 | 156 | 12 |

Total period of trapping, 124 days. Per cent. males, 26·4 ; Per cent. females, 73·6.

*Orchard No. 2.*

| Date of Examination: | Number Moths Trapped. | Number Males. | Number Females. | Number Traps. |
|---|---|---|---|---|
| 1930. | | | | |
| 15 October .. .. .. .. | 7 | 3 | 4 | 8 |
| 20 October .. .. .. .. | 10 | 0 | 10 | 8 |
| 27 October .. .. .. .. | 26 | 11 | 15 | 8 |
| 3 November .. .. .. .. | 15 | 8 | 7 | 8 |
| 10 November .. .. .. .. | 16 | 5 | 11 | 8 |
| 17 November .. .. .. .. | 12 | 0 | 12 | 8 |
| 24 November .. .. .. .. | 13 | 0 | 13 | 8 |
| 12 December .. .. .. .. | Traps all | dried out | | |
| 16 December .. .. .. .. | 18 | 2 | 16 | 8 |
| 22 December .. .. .. .. | 12 | 4 | 8 | 8 |
| 30 December .. .. .. .. | 6 | 2 | 4 | 8 |
| 1931. | | | | |
| 8 January .. .. .. .. | 19 | 2 | 17 | 8 |
| 17 January .. .. .. .. | 12 | 5 | 7 | 8 |
| 27 January .. .. .. .. | 8 | 5 | 3 | 8 |
| 16 February .. .. .. .. | 6 | 3 | 3 | 8 |
| Totals .. .. .. | 180 | 50 | 130 | 8 |

Total period of trapping, 124 days. Per cent. males, 27·8 ; per cent. females, 72·2.

TABLE VI.

MISCELLANEOUS INSECTS CAUGHT IN MOLASSES BAITS FROM 15 OCTOBER, 1932, TO 16 FEBRUARY, 1933, IN 20 TRAPS.

| *Hemiptera.* (Bugs.) | *Coleoptera.* (Beetles.) | *Hymenoptera.* (Wasps.) | *Lepidoptera.* (Cutworm moths, army-worm moths, etc.) |
|---|---|---|---|
| 387 | 382 | 137 | 1,106 |

### Effect on Codling Moth.

The spraying programme and the cleaning up of all codling-moth-infested fruit would probably account in some measure for the comparatively few codling moths trapped. Little control can be claimed from trapping in either of the orchards, the infestation being only slightly less than during the previous season.

### Acknowledgments.

Thanks are due to Messrs. Pfrunder and Letters, who made available facilities for this experiment.

## D.—CONTROL BY DUSTING OR SPRAYING.

The results obtained by experimental work carried out during the 1927-28 and 1928-29 seasons for the control of codling moth in the Stanthorpe district indicated that almost equally good control could be obtained by the application of arsenate of lead in dust form as is practicable with a wet spray. However, as the percentage of codling moth infestation in the check row was inconsiderable during both seasons, results were considered inconclusive, and it was decided to repeat the experiment in an orchard where codling moth infestation had been very severe during the last few years.

The area chosen for experimental work was again in the Summit district, and it was separated from surrounding orchards by fairly large areas of scrub land, being thus more or less isolated. The codling moth infestation during the last few years was exceptionally heavy in this orchard, and in the 1928-29 season quite 60 per cent. of the fruit was destroyed by this pest. It was thus very suitable for the work in view, and it was hoped that some definite results would be obtained regarding the respective merits of dusting and wet spraying.

### Experimental Plots.

The plots used for the experiment covered an area of approximately 2 acres, and consisted of six rows of trees containing fifteen trees to the row, and five rows of trees containing fourteen trees to the row. The former were wet sprayed and the latter dusted, one control row of five trees being left untreated.

The wet-sprayed plot was situated nearer to the packing shed than the dusted trees and the check row, and it was concluded that the infestation would be somewhat heavier in the wet-sprayed plot if no control measures were adopted.

The trees were 20 feet apart and were from eight to ten years old, and very unequal in regard to size and quality. The following varieties of apples were represented:—Granny Smith, Jonathan, Munro Favourite, American Summer Permain, Nicojack, Ben Davis, and Mackintosh Red. The variation in the trees would account for the comparative poorness of the crop, which was a very light one.

### Materials Used and Method of Application.

The spray mixture was applied with a power spray outfit at a pressure of 200 to 225 lb. One man and one horse were used to operate the sprayer. The dust mixture was applied with a hand Niagara dusting gun, having a capacity of about 9 lb. Six treatments were made with the dust, the first coinciding with the calyx spray and the others thirteen, twenty-eight, fifty-seven, seventy-five, and eighty-six days later respectively. Four treatments were given with the wet spray—namely, the calyx spray and three others, fourteen, forty-nine, and seventy-five days later respectively. A fine nozzle was used for spraying, and the spray applied in a mist-like cloud. Trees were thoroughly sprayed from both sides, the aim being to direct the spray downwards into the tree. The dust used was the Cloudform A.P. No. 1, containing 15 per cent. arsenate of lead and 85 per cent. reducer. Dustings were made when possible in a still atmosphere and the trees well covered. The dust could be seen on the trees throughout the season.

The dates of application of the dust and spray, strength at which materials were used, and cost figures are given in Table VII. Cost figures are calculated on skilled labour at 2s. 6d. per hour, A.P. No. 1 dust at the local price of 29s. 6d. per 56 lb., and arsenate of lead at the rate of 1s. 9d. per lb. Apples are calculated at 200 to the case, this being a general average.

### Codling Moth Infestation.

The codling moth infestation throughout the district was exceptionally heavy, and this was also the case in the experimental orchard, as will be seen from the 100 per cent. infestation of the check row. It was found possible to make nearly all dustings and sprayings at critical times, owing to the favourable weather conditions experienced throughout the season.

Losses from causes other than codling moth were remarkably small and were virtually negligible. These losses included apples unsound or cracked, individual fruits infected with *Penicillium,* "dead stings," and one or two fruits attacked by fruit fly.

### Summary.

The results as set out in the tables demonstrate the superiority of wet spraying over dusting as a control of codling moth, and the infestation of the entire crop of apples in the control row is an eloquent illustration of the loss that must follow the failure to adopt control measures. It also shows that efficient spraying, even in an orchard where codling moth has been long established and is very prevalent, will give a reasonable control of this pest.

The dusted trees, although situated well away from the packing shed, which is an acknowledged source of infestation, and given six

applications of the dust, showed a 40 per cent. loss from codling moth. The sprayed plot, on the other hand, although situated nearer to the packing shed and receiving only four treatments, showed only a 15 per cent. loss from codling moth.

Dusting has many advocates owing to the ease and quickness with which it may be applied, and it certainly may prove of value to supplement spraying at critical times, but the results now obtained do not justify the recommendation of dusting as a substitute for wet spraying for codling moth control.

TABLE VII.

TIME AND COST OF APPLICATIONS IN DUSTING AND SPRAYING EXPERIMENTS.

| Date of Application. | Number Trees Treated. | Materials Used and Strength. | Quantity Used. | Time Required. | Cost. Labour. | Cost. Material. | Cost. Total. |
|---|---|---|---|---|---|---|---|
| | | | Lb. | h. m. | s. d. | s. d. | s. d. |
| 9-10-29 | 70 | A.P. No. 1 Cloud-form Dust containing 15% Arsenate of Lead, 85% Reducer. | 6 | 0 30 | 1 3 | 3 0 | 4 3 |
| 22-10-29 | 70 | | 11 | 0 40 | 1 8 | 5 6 | 7 2 |
| 6-11-29 | 70 | | 4½ | 0 30 | 1 3 | 2 3 | 3 6 |
| 5-12-29 | 70 | | 5¼ | 0 30 | 1 3 | 2 7½ | 3 10½ |
| 23-12-29 | 70 | | 6 | 0 30 | 1 3 | 3 0 | 4 3 |
| 3-1-30 | 70 | | 6 | 0 30 | 1 3 | 3 0 | 4 3 |
| | | Totals .. | 38¾ | 3 10 | 7 11 | 19 4½ | 27 3½ |
| | | | Galls. | | | | |
| 9-10-29 | 90 | Arsenate of Lead 2½ lb. to 60 galls. | 40 | 2 30 | 6 3 | 2 7½ | 8 10½ |
| 23-10-29 | 90 | | 38 | 2 45 | 6 10½ | 2 6½ | 9 5 |
| 27-11-29 | 90 | | 40 | 2 30 | 6 3 | 2 7½ | 8 10½ |
| 23-12-29 | 90 | | 41 | 2 45 | 6 10½ | 2 8 | 9 6½ |
| | | Totals .. | 159 | 10 30 | 26 3 | 10 5½ | 36 8½ |

TABLE VIII.

RESULTS OF DUSTING AND SPRAYING EXPERIMENTS.

| Treatment. | Number Trees. | Total. Quantity of Fruit in cases. | Sound. Number Cases. | Sound. Per Cent. | Unsound. Number Cases. | Unsound. Per Cent. |
|---|---|---|---|---|---|---|
| Dusted .. .. .. | 70 | 74 | 44 | 59·5 | 30 | 40·5 |
| Wet sprayed .. .. | 90 | 104 | 88 | 84·6 | 16 | 15·4 |
| Untreated .. .. .. | 5 | 8 | 0 | 0 | 8 | 100 |

## Acknowledgment.

In conclusion, I would like to express appreciation to the Chief Entomologist, Mr. Robert Veitch, for his valuable co-operation and advice.

# AGRICULTURAL NOTES.

By H. S. HUNTER, Agricultural Branch.

## Lucerne the King of Fodders.

LUCERNE has been aptly termed the "king of fodders," an application which fits it admirably in Queensland, where periodical dry spells are of regular occurrence. Not only is the crop unsurpassed in feeding value, but it is drought resistant, lends itself to conservation for lengthy periods, once established the crop persists from year to year, and calls for comparatively little attention. In addition it acts as a soil renovator rather than as a soil exhauster. Although the cultivation of lucerne is extending in Queensland each year, its distribution is not nearly so extensive as its value would seem to warrant. The plant demands certain conditions and types of soils, but recent experience has shown that these are not so limited as was at one time believed. For example, since the fall in wheat values and the consequential extension of the dairying industry to the inland sandy loam wheat areas of New South Wales and Victoria lucerne has been grown successfully on those soils. Its value to the Maranoa has been demonstrated by Mr. R. S. McGeoch, of Roma Downs Station. The establishment of lucerne in such areas has been facilitated by light sowing, even as light as 2 lb. of seed per acre.

The range of the crop has been extended also by innoculating the soil with the particular nitrogen fixing bacteria necessary for its successful growth, as, in some cases, the absence in the soil of this organism has been the only obstacle to the establishment of a lucerne crop.

Lucerne also forms a valuable constituent of pasture, and should give good results when sown in conjunction with Rhodes grass, using not more than 2 lb. of lucerne seed per acre. A more extensive use of lucerne as a pasture plant has been advocated by Mr. W. Davies, the Empire grassland expert, who has suggested that efforts be directed towards the evolution of a strain with a habit of growth more suited for grazing than the ordinary cultivated type.

## Crop Prospects.

Some relief was given by the late June rains. Falls in Southern Queensland, exceeding 1 in., were more general in the coastal areas, but it is pleasing to note that the new settlers on the former prickly-pear infested county of the Dulacca-Chinchilla area received up to 2 inches. In most of the dairying districts young fodder crops will receive a much-needed impetus, and now will be enabled to become sufficiently well established to permit of their being grazed by stock.

The danger of drought conditions, however, is not yet passed, and additional good rains of a soaking nature are needed at an early date before the late winter and early spring months can be approached with confidence.

Wheat may be sown under seasonably good conditions in the Milmerran, Leyburn, and Inglewood districts, where the precipitations recorded ranged from 1 inch to 140 points, but elsewhere throughout the wheat belt, including the Maranoa, the average falls were in the vicinity of half an inch. Although this is somewhat short of immediate requirements, it will be helpful to the young crops sown on dry land and which germinated after the light rainfall received early in June, also for plantings made immediately after those rains. As the season is well advanced, the balance of the sowings most probably will be made now, and provided July is a little more generous than usual in the matter of rain, all these latter sowings also should come through their preliminary stages of growth successfully.

## Production Problems.

Important questions affecting the interests of primary producers still are awaiting solution. Amongst the most important of these is the question of restricting wheat acreages in the principal wheat exporting countries. Although Queensland is not at present concerned in the wheat export trade, the object which the proposal aims at—a raising of prices—is of immediate and vital concern to this State, particularly as commodity prices generally are influenced to a great extent by the price of wheat. Additionally, local proposals for an Australian domestic price for wheat are being held in abeyance. New Zealand has stabilised its own domestic price by the appointment of a Wheat Purchase Board, which is to control all transactions in wheat in the Dominion.

The reasons for Australia's objection to a curtailment of wheat acreages are well understood within our borders, and, as was to have been expected, the Commonwealth has adopted the attitude that development should not be retarded by this means, and wheat farmers in single-crop areas heavily penalised, unless it were felt definitely that advantages would accrue. One obstacle in the form of unrestricted production in Europe of wheat protected by high tariffs and import embargoes, was shown to be most formidable in a recent bulletin issued by the International Institute of Agriculture, which stressed the danger to Europe, with its large population, of the extension of wheat growing during the war period to sparsely populated countries.

The question of most immediate concern to Queensland is that of a domestic price for butter and cheese. As the States are in agreement on the proposal, it only remains for the Federal Government to announce its intentions in this regard.

Primary producers' organisations have been invited to tender evidence before the Royal Commission on petrol, relative to the effect upon primary production of the prices of power kerosene, and in Queensland inquiry is to be made by the Commissioner of Prices into the prices of dairy farm machinery as recommended by the Royal Commission on dairying.

### Improved Prices.

The present time is not without encouraging signs from the producer's point of view. A trend appears to have developed towards an improvement in prices of staple commodities. Values of wool are appreciating, and wheat prices have advanced sharply in North America, following on the effects of unfavourable weather conditions in the wheat belts of Canada and the United States. Other grains and cotton also have responded to the upward movement in values.

Locally, an encouraging improvement has occurred in pig prices, with a seasonal rise in the values of farm fodders and potatoes. The prevailing cold weather is not assisting the demand for fruit.

Breeders of good quality draught horses have been reaping the benefits of their industry and foresight for some considerable time. Evidences of the return to the horse for farm work are shown in the high values and the improvement, both in quality and quantity, in the horse sections of country and metropolitan shows.

### Farm Fodders.

With the continued dry weather and the advance of the winter months farm fodders are appreciating in value, particularly lucerne chaff, which at the time of writing has realised up to £8 per ton. This is really a very high price when it is considered that the fodder is purchased principally for the ultimate production of other commodities which have slumped to exceedingly low market values.

Lucerne hay also is in better demand, and maize values are steadily improving, with every indication of a considerable advance in the near future. Apart from commercial lots, there is a good demand from New South Wales for lines suitable for seed purposes. The crop on the Darling Downs generally was poor, although success has been reported with early maturing varieties in the Allora district. Much of the Downs maize normally finds a market across the border, and as the crops in the Northern portion of New South Wales produced light yields there is a possibility of a stronger Southern inquiry on the Brisbane market.

The maize crop on the Atherton Tableland, which is now nearing maturity, has experienced a favourable season, and it has been estimated to yield approximately 18,000 tons.

### Fruit and Vegetables.

Better quality bananas have been in steady demand, but most other lines of fruit are dull of sale. The market has been well supplied with local citrus, pineapples, strawberries, and papaws, also apples and pears from Tasmania. Good prices are being obtained for locally grown potatoes, and the demand for pumpkins has improved. Potatoes from the South for seed purposes are not sought after owing to the dry weather. There have been heavy condemnations of faulty lots, both from local growers and from across the border. Green vegetables are in better supply. Consignments of crisp, fine-flavoured celery are arriving from South Australia, which State has built up a valuable trade with this vegetable on Melbourne, Sydney, and Brisbane markets. Exports to the Eastern States have increased from 200 crates in 1928 to 60,000 crates in 1932.

# THE USE OF DELINTED COTTON SEED FOR PLANTING PURPOSES

By LLOYD HODGE, Manager, Cotton Research Station, Biloela.

IT would appear from the experience gained during the past two or three seasons, and from investigations conducted at the Cotton Research Station at Biloela, that the use of delinted cotton seed for planting purposes ensures quicker germinations, more even distribution of seed, and better ultimate stands than are obtained from planting undelinted seed.

This is illustrated in a striking way by the following experiment:—One side of a two-row drill was arranged to plant delinted seed while the other side sowed undelinted, both sowing at the rate of 20 lb. per acre. The test covered 1 acre sixteen rows wide. From the sixth to the twelfth day inclusive, after sowing, population counts of the resulting stand were made. The subjoined table shows the comparative rate of germination between the two treatments, expressed as the percentage of the *possible* germination daily and the final stand per foot obtained in each—

| Seed. | 6th Day. | 7th Day. | 8th Day. | 9th Day. | 10th Day. | 11th Day. | 12th Day. | Plants per Ft. |
|---|---|---|---|---|---|---|---|---|
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | |
| Delinted .. .. .. | 49·1 | 65·2 | 69·4 | 72·4 | 73·8 | 75·2 | 76·3 | 4·5 |
| Undelinted .. .. .. | 7·9 | 25·7 | 33·9 | 40·9 | 44·9 | 49·6 | 52·3 | 2·0 |

The principal gain appears to be due to the fact that the delinted seed, without the coating of fuzz, is brought into more intimate contact with the soil moisture. It must be borne in mind in this connection that sufficient germinating moisture is more often than not difficult to obtain for early planted cotton. Scrub soils, with their more or less waterproof coating of ashes, newly-broken land, hurriedly prepared cotton or maize stubble, the lightness of the early spring rains, the limits as to the depth at which cotton may be planted, are all factors which contribute to the especial difficulty of obtaining sufficient moisture to ensure complete germination.

The removal of the fuzz from the seed, in allowing the seed coat to come into closer contact with the damp soil, undoubtedly enables the grower to obtain satisfactory stands under conditions which would render the achievement of the same stands doubtful or even impossible if undelinted seed had been planted.

In addition to this, the removal of the fuzz renders the seed more fluid, and consequently permits of more even sowing and a more consistent depth being maintained.

## Rate of Sowing.

Various rates of sowing delinted seed have been advocated, from as low as seven to as high as 20 lb. to the acre.

In order to obtain information on the subject, carefully conducted field experiments and laboratory examinations were carried out at the Cotton Research Station during the 1932-33 planting season. The results indicated that after allowing for mutilated and unsound seed there are around 3,000 to 3,500 sound seed per pound of delinted Durango cotton seed. The number varies naturally with the percentage of good seed in the sample, but for general practical purposes the figures given may be taken as a representative average. As there are 9,680 ft. of rows in an acre in which the rows are spaced 4½ ft. apart, an increase of approximately .3 of a plant per foot is obtained for every pound of seed sown. The following would represent the vital seeds sown per foot at the indicated rates of planting:—

9 lb. per acre = 2.8 vital seeds per foot.
10 lb. „ = 3.1 „ „
11 lb. „ = 3.4 „ „
12 lb. „ = 3.7 „ „
13 lb. „ = 4.0 „ „
14 lb. „ = 4.3 „ „
15 lb. „ = 4.6 „ „

In order to test the reliability of this table, sowings of delinted seed were made in the field over an acre, the rates being very carefully regulated to 9 lb., 12 lb., and 15 lb. respectively. Germinating conditions were good, and when the germination was complete, a count of the entire populations gave the following figures, expressed as plants per foot:—

At rate 9 lb. per acre = 2.05 plants per foot.
„ 12 lb. „ = 3.46 „ „
„ 15 lb. „ = 4.18 „ „

It will be seen by comparison with the laboratory table given above that the field results approximated very closely, being only 13 per cent. lower over all treatments. This is, of course, to be expected, as the laboratory germinations are conducted under ideal conditions. It must be borne in mind that conditions for germination during the course of this experiment were very favourable, and a germination above the average that would be obtained on a large commercial planting resulted.

It is emphasised that the percentage of vital seeds sown which do not survive to the thinning stage is a very variable quantity, and is much higher than is generally supposed. Drying out of the seed-bed, insect attacks, fungoid diseases, to mention only a few, are examples of the reducing influences which may, and do, whittle down the number of young seedlings. Close tests carried out at the Research Station, where the sowing rates of the drills are known exactly, and the germination tests have given the vital seeds per lb. factor, have revealed the surprising fact from population counts subsequently made, that what appears to be a satisfactory commercial stand may have failed to germinate from 13 per cent. to 45 per cent. of the vital seeds sown. Add to this percentage losses of seedlings which occur between germination and thinning, and one begins to realise that a margin must be allowed in the planting rate to cover these contingencies.

On this account it is strongly recommended that not less than 10 lb. per acre of delinted seed be planted, when sown through a seed drill, and preferably at least 12 lb. of varieties like Durango and Lightning Express. When planting the varieties with larger seed, such as Acala, Mebane, and Lone Star, it is possible that over a series of seasons more seed than this will be found to be of advantage. Numerous cases, doubtless, could be quoted where good stands have been obtained from lighter sowings, but with the low price of seed a grower is well advised to plant enough to insure against a probably gappy stand. Ten lb. per acre gives a possible three plants per foot, when the rows are 4 ft. 6 in. apart, assuming that every vital seed sown germinates, and that every germinated seed lives; so that when growers remember from their own experience how many things can and do happen to the young seedlings before thinning time, it will be understood that the safety margin at three plants per foot is none too large.

### Rate in Unstumped Scrub, when Planted by Hand.

When the planting of unstumped scrub soils is undertaken, either with a walking-stick planter or with the hoe, the following table will give the grower the necessary information as to how many vital seeds he is planting to the hill at pounds per acre, when he spaces his hills either at 18 in. or 24 in. apart and his rows 4 ft. 6 in. apart. The vitality of the seed, and the number of seeds in a pound are assumed to be the same as in the table already given for drill planting:—

| Rate. | Hills 18 Inches Apart. | Hills 24 Inches Apart. |
|---|---|---|
| 4 lb. per acre .. .. .. | 1·85 vital seeds per hill | 2·44 vital seeds per hill |
| 5 lb. per acre .. .. .. | 2·31 vital seeds per hill | 3·05 vital seeds per hill |
| 6 lb. per acre .. .. .. | 2·77 vital seeds per hill | 3·66 vital seeds per hill |
| 7 lb. per acre .. .. .. | 3·23 vital seeds per hill | 4·27 vital seeds per hill |

### How to Sow Delinted Seed through the Undelinted Cotton Seed Hopper.

Although the cotton drills on the market at present are designed to sow undelinted seed, they may be adapted for delinted seed with a slight alteration of the slide opening through which the seed falls on to the feed wheel. With the ordinary square-ended slide a point must inevitably be reached, when closing the seed opening, where the opening is less than the diameter of the seeds, and no seeds are dropped. Before this point a stage is reached when the largest seeds are held back, which means that either the largest and best seeds are graded out or the drill is being clogged up. It has been ascertained that a quarter-inch opening gives a somewhat irregular sowing rate of approximately 12 lb. per acre. A quarter-inch opening is very small, and it is not unlikely that with this minimum opening choking of the feed may occur through bits of foreign matter gradually bridging the opening. It is recommended, therefore, that growers cut a pair of seed regulator slides for the seed hoppers out of 24 gauge iron, and then cut a small rectangular notch in the middle of the end which is used to regulate the flow of seed, as shown in Fig. 1.

This opening if cut ¾ in. long by ½ in. deep will give about a 10 lb. to the acre rate when the slide is pushed right home. Growers should, however, experiment themselves with a gradually increased opening until the required rate is arrived at, and this can be done quite easily in the following way:—

There are 9,680 ft. of row in an acre, when the rows are spaced 4 ft. 6 in. apart, and since in a two-row planter each hopper plants only half an acre to every acre the whole machine plants, it follows that each wheel travels only half of 9,680 ft., or 4,840 ft. to the acre planted.

In the P. and O. planter the wheels are 94 in. in circumference, so that by dividing 94 into 58,080 (inches in 4,840 ft.) one ascertains that each wheel revolves 618 times (in round numbers) for every acre planted by the machine. If the machine is therefore jacked up, with both wheels clear of the ground and both hoppers filled, it can be readily determined what the planting rate is and if both hoppers are distributing at the same rate. On the abovementioned machine, 206 turns round would sow one-sixth of an acre from each hopper, so that multiplying by 6 the weight of seed distributed through a hopper the acre rate can be determined.

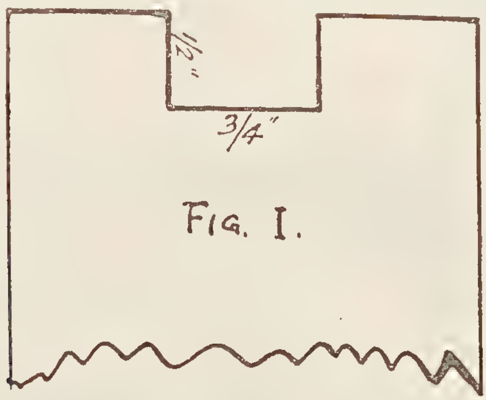

FIG. I.

When the circumference of the planter wheel is other than 94 in., the same principle may be applied, divide the circumference in inches into 58,080 to find the number of turns per acre, and multiply the seed discharged by each hopper by the fraction of an acre represented by the number of turns given to the wheel.

It is a help to tie a rag to one of the spokes as a marker when turning.

**To Sow Delinted Seed Through Maize Plates.**

Should the grower only have a drill designed for planting maize, the six-hole plate, when the holes are ⅜ in. diameter, will sow delinted seed satisfactorily if the cut-off plate is removed and a spring steel strap of ⅛ in. steel and 1 in. wide is inserted in its place. This strap must be centre bored for the insertion of the winged holding-down screw, and the ends filed with a notch to correspond with the notch on the rim of the cut-off plate, which prevents it turning with the holed seed plate. This strap serves the purpose of holding the ring cog (which carries and revolves the holed seed plate) down on to the bevelled driving cog, and also allows the delinted seed to flow freely. In principle, it is necessary to remove as much non-moving metal as possible from over the seed plate, otherwise the delinted seed has a tendency to bridge over the holes. It is a help also to insert in the side of the hopper a short rod (a 3-in. by ¼-in. bolt with the head cut off will do) which has the last inch bent down at right angles, so that it just clears the six-hole plate. This moves the seeds about between the holes and assists in more even feeding.

If a heavier rate of sowing is desired, it will be necessary to enlarge the holes with a round file. Six holes bored out to ¾ in. has been found to give a rate of 21½ lb. per acre with the P. and O. machine in low gear.

In conclusion, it is repeated that where germination moisture is low, the use of delinted seed is a distinct improvement over undelinted, and that as germination moisture early in the season in Queensland is generally low, the using of delinted seed, both in cultivated land and newly burned scrub, is strongly recommended. It is pointed out, however, that planting delinted seed in dry soil to await the germinating rains may necessitate replanting in a spring in which light storms are experienced. Undelinted seed may, therefore, be more suitable for planting in the dry in all classes of soils on account of less possibility of germination being started with light showers.

# MANURES AND MANURING.

By E. H. GURNEY, Senior Analyst.*

THE term manure is usually used in reference to farmyard manure and bulky organic material which improve the physical and biological condition of the soil, as well as supplying plant food.

Fertilizers, often spoken of as artificial fertilizers, are the names given to what may be termed manufactured materials used by cultivators of soil to supply plant food to their crops.

The earth, including the vegetable and animal life upon it, is composed of material built up by the combination of some eighty-odd elements. Of these, though it may be necessary for the soil to supply a number for successful plant growth, the majority are usually present in sufficient quantities in soils in available form for plant needs, and the elements nitrogen, phosphorous, potassium, and calcium are the only ones that may be necessary to be applied in manures or fertilizers.

Under certain soil conditions and crop requirements it has been found that the application of small quantities of such elements as manganese, boron, copper, &c., has resulted in healthy and increased crop growth, though it must be remembered that these elements when present in more than minute quantity become toxic to plants.

Mention may be made of the elements sulphur and magensium. It has been reported that in some countries sulphur, or compounds containing sulphur, applied to some soils has caused the production of larger crops with increased protein content. The sulphur content of pastures and the effect of the application of ammonium sulphate on the sulphur content of pasture has been investigated by Askew and Bishop in New Zealand.

In the 1914 Annual Report of the Agricultural Chemist, Mr. J. C. Brünnich, it is stated that a large number of Queensland soils had been tested for their sulphur content and that there was in most of the soils sufficient supplies of sulphur for crop requirement.

In connection with supplying sulphur to soils, it must be remembered that when application of such fertilizers as superphosphate, sulphate of potash, and ammonium sulphate is made to the soil a certain amount of sulphur is supplied.

Regarding magnesium, it has been found in many cases that the application of fertilizers containing some compound of this element has caused improvement in the quality of some kinds of tobacco leaf.

In nature plant life decays and is deposited where it has grown, returning to the soil organic matter containing mineral plant food in readily available form for future plant life, and thus the soil in this case is not depleted in any way and retains its fertility.

In the case of cultivated or pasture soils, the crops grown are removed with the plant food material they have absorbed from the soil during growth and unless means are taken to return to the soil such food material, the continued removal of crops will ultimately cause infertility in the richest soil.

In this country, owing to the fact that in the past there has been available a relatively large amount of good virgin country, it has been a somewhat common practice to crop the land until more or less depleted, then when this occurs to remove from this worn-out soil and cultivate fresh virgin soil. Now that there is not available the quantity of rich virgin soil the abovementioned practice will necessarily be restricted. It should be stated here that it is easier to maintain a soil in a fertile condition than it is to bring a thoroughly depleted infertile soil back to fertility.

One of the means available for maintaining soil fertility is by the application of manures and fertilizers to the soil, but it must be understood that if the soil is not in good tilth, or is badly drained, successful results will not be obtained from the application of fertilizers.

It has been mentioned that the four elements—nitrogen, phosphorous, potassium, and calcium—are the main ingredients considered necessary to be supplied in fertilizers. The last three mentioned when considered in fertilizers, are estimated as phosphoric acid—potash—and lime, and for our purpose these substances may be considered as mineral plant food ingredients.

Manures, such as farmyard manures, green manure crops, composted vegetable matter, &c., are used essentially for supplying humus to the soil and thus improving

* In a radio lecture from station 4QG.

the physical and biological conditions of the soil, but such manures, depending upon particular soil condition and crop requirement, may or may not be able to supply the particular amount of any mineral plant food required.

The great value will therefore be seen of using farmyard manure, together with artificial fertilizers. For not only is any deficiency of mineral plant food that is not supplied in the farmyard manure made good by supplementing with a fertilizer, but the efficiency of the fertilizer is improved by the increased soil's solvent and bacterial action upon the fertilizer, due to humus of the farmyard manure.

One ton of mixed farmyard manure contains from 450 to 700 lb. of organic matter, 10 to 15 lb. of nitrogen, 3 to 6 lb. of phosphoric acid, and from 8 to 16 lb. of potash.

The composition of green manure crops varies very much according to the kind of crop used, the nature of the soil upon which it is grown, and the cultural treatment of the crop. The average amount of material returned to the soil by ploughing in crops from an acre of some different varieties of cowpea is as follows:—

| | |
|---|---|
| Organic matter | 14,976 lb. |
| Nitrogen | 364 lb. |
| Phosphoric acid | 97 lb. |
| Potash | 400 lb. |

The artificial fertilizers may be grouped according to the fertilizing ingredient they supply, some containing a single ingredient, others, namely, mixed fertilizers, supplying more than one ingredient. Again the fertilizers may be grouped as "quick acting" or "slow acting" according to the speed in which the active fertilizing ingredient becomes, when in the soil, available to plants.

The time required for a fertilizer to become available to plants depends upon its degree of solubility in the soil water, and also upon the state of fineness of the fertilizer.

Thus the fineness of such materials as bonedust, lime, and pulverised limestone is of particular importance, as the more finely these materials are ground the sooner do they become available to crops.

A few of the more commonly used fertilizers will be briefly mentioned.

*Fertilizers containing Nitrogen.*

Nitrate of soda—15 to 16 per cent. nitrogen; very quick acting.

Sulphate of ammonia—20 to 21 per cent. nitrogen; quick acting.

Dried blood—11 to 12 per cent. nitrogen; fairly quick.

*Fertilizers containing Phosphoric Acid.*

Superphosphate—20 to 21 per cent. phosphoric acid; quick acting.

Nauru phosphate—37 per cent. phosphoric acid; slow acting.

*Fertilizers containing Potash.*

Sulphate of potash—48 per cent. potash; very quick acting.

Muriate of potash—50 per cent. potash; very quick acting.

*Fertilizers containing Nitrogen and Phosphoric Acid.*

Bone dust—3 to 4 per cent. nitrogen and 20 to 25 per cent. phosphoric acid; slow acting.

Meatworks fertilizers—3 to 7 per cent. nitrogen and 14 to 20 per cent. phosphoric acid; slow acting.

*Mixed Fertilisers containing Nitrogen, Phosphoric Acid, and Potash.*

Mixtures composed of quick acting materials or of mixtures of quick and slow acting materials.

*Materials supplying Lime.*

Quick lime or burnt lime.

Agricultural lime—pulverised limestone, pulverised shells, &c.

Gypsum—Calcium sulphate.

The above list does not include all fertilizing material on the market. There are now a number of nitrogenous fertilizers synthetically manufactured from the nitrogen of the air.

In manuring, consideration has to be given to the nutrient requirement of any particular crop, and also to the soil's capacity of supplying such nutrient. If the soil has an ample supply of any one plant food it is certainly not necessary to give more of such plant food by means of manure.

Again, though it is admitted that a number of our soils are deficient in phosphoric acid, it must not be assumed that superphosphate is the only fertilizer required.

Valuable information can be gained as to the fertilizer requirement of a soil by a few duplicated small experimental trials, provided, of course, that favourable physical condition (tilth, &c.) of the soil exists. Different crops have different manurial requirement, and have also different root development, and varying power of assimilating their food from the soil.

Thus, as a general rule, cereals and grasses have very good power of assimilating nutriment from the soil—leguminous crops somewhat less power—and root crops a poor assimilative power.

The nutrient requirements of a few crops stated in a brief and general manner, are as follow:—

Leguminous crops, such as lucerne, peas, &c., respond well to the application of lime and require ample supplies of potash and phosphoric acid.

Though these crops contain large amounts of protein (nitrogenous body), they do not require fertilizers containing nitrogen as they obtain their nitrogen from the air through the agency of bacteria existing on their roots.

Maize grows best on soils well supplied with humus, and if grown for grain on such soils, requires a fertilizer containing only phosphoric acid and potash, but if grown for green fodder the addition of some nitrogen with the above fertilizers will stimulate growth and give increased croppage.

For the best results with vegetables the soil must be well supplied with humus; on such soil carrots and turnips require fertilizer containing high phosphoric acid, with fair potash content; potatoes, a fertilizer with high potash and fair phosphoric acid content; tomatoes, a fertilizer with high phosphoric acid and high potash content.

Grown on soils deficient in humus the fertilizers mentioned for these vegetables would require to be supplemented with a small amount of nitrogenous fertilizer.

For vegetables the best source of humus is well rotted farmyard manure.

The general effect upon plant life of the different ingredients in fertilizers may now be stated:—

Nitrogen stimulates the growth of the stems and foliage of plants, and if an excessive amount of available nitrogen exists, particularly in the presence of a deficiency of phosphoric acid and potash, very vigorous plant growth occurs, but with poor development of flowers and fruit.

Nitrogen increases grass growth, which is valuable if the young grass is utilised, but if present in an excess is liable to cause rankness in the matured grass.

Phosphoric acid encourages root growth of plants, increases crop yields, and accelerates the ripening and maturity of crops.

Potash seems to be connected with the formation of starch and sugar in plants, and in some cases with increased crop yield.

Potash deficiency causes plant growth to be less resistant to disease.

Lime improves soil tilth, causes conditions favourable for bacterial growth, and neutralises soil acidity.

Thus it will be seen that for successful crop growth not only is it necessary for all these fertilizing ingredients to be present, but that all must be present in correct proportion for any particular crop. It must be understood that without good physical and biological soil conditions, the application of fertilizers can not yield successful results.

In connection with the selling and buying of fertilizers, in many countries there are Fertilizer Acts, which Acts were brought into force for the purpose of protecting both seller and buyer of fertilizers. The Queensland Acts of 1914 to 1916 require every seller of fertilizers to obtain a license to sell, and that such licensed dealer must give to the buyer upon sale of any fertilizer an invoice certificate.

This certificate must have upon it the name of the seller and the name of the buyer, the name and weight of fertilizer sold, together with the percentage of nitrogen, phosphoric acid, and potash existing in the fertilizer, and the forms in which these fertilizing ingredients occur. Also the fineness of such materials as bone dust, meatworks fertilizer, Nauru phosphate, and lime has to be stated.

A buyer should always retain such invoice, as reference to it may at times be required.

The bag containing the fertilizer sold is required by the Act to have a label attached stating the name and weight of the fertilizer, and with composition and fineness as mentioned in the invoice.

By this means the buyer can see what he is purchasing and is informed as to the nature of the fertilizing ingredients—whether quick or slow acting.

# SOILS AND SOIL FERTILITY.

By E. H. GURNEY, Senior Analyst.*

SOIL is the friable material formed from the weathering of rocks and the decay of plants and animal life. The soil must be considered not only as serving as a foothold for plant life, but also as a factory in which material is transformed into a form suitable for plant food.

Some weathering agencies by which rocks are broken and decomposed into soils may be briefly mentioned:—

*Changes of Temperature.*—The different constituents of rocks expand and contract to a different extent when subjected to different degrees of temperature and the alternate expansion and contraction ultimately cracks the rock, causing pieces to fall off.

*Water.*—Rain falling upon rocks wears away the surface and running streams of water have similar wearing down action upon rocks, and such action is still further increased by the presence of small particles of rock material contained in streams.

Water, also containing carbonic acid, has an increased solvent action upon some rock material, and in this way the rock structure is weakened and ultimate disruption of the rock occurs.

*Wind.*—Wind carrying small particles of loose material beats upon the rock surface and wears this surface down.

*Plant Life.*—The roots of plants force their way into crevices of rocks and push the rock particles still further apart, thus helping in breaking down the rock. Plant life in decaying forms organic acids which are capable of dissolving some of the rock material and thus weakening the rock.

All the above agencies have been mentioned as causing the breaking down of rocks, but it must be fully recognised that these same agencies are acting in a similar way in breaking up particles of soil and, therefore, cultural operations such as ploughing, bare and crop fallow, soil drainage, efficiently conducted, are all aids towards procuring soil material suitable for crop growth.

The consideration of soil material suitable for crop growth—namely, the fertility of soil—will require taking into account various soil properties. And a most important fact is that these soil properties must be considered in conjunction one with another and not singly. Only brief mention will be made of the many factors upon which the fertility of the soil depends, and for convenience the soil properties are included under the following three divisions:—

Physical condition,
Chemical condition, and
Biological condition.

*Physical Condition.*—Under this heading consideration must be given to the following properties:—Tilth, water-holding capacity, capillary capacity.

*Tilth.*—This is the condition into which the surface soil may be brought by cultivation. A soil with good tilth is one which upon working forms a good seed-bed—that is a soil whose constituents break down into fairly small granules which remain in a friable condition—the term "crumb-like structure" has been applied to this condition.

Improvement of tilth may be obtained by cultivation, fallowing, drainage, liming, and the addition of humus.

## Water Holding Capacity.

By this is meant the power a soil has of holding water falling upon it. This property depends partly upon the porous nature of the soil, but more particularly upon the nature of the soil ingredients. Of these ingredients humus has greatest water-holding capacity, followed in order by clays, loams, and sands.

It is considered that the most successful plant growth is obtained when the water content of the soil ranges from 40 to 50 per cent. of the total water-holding capacity of the soil.

The soil capacity for retaining water may be improved in some cases by cultivation, but the greatest improvement is obtained by increasing the humus content of the soil.

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* In a radio lecture from station 4QG.

**Capillary Capacity.**

The water in a soil exists as a film coating the surface of the soil particles. The power a soil has of circulating water within itself is termed its "capillary capacity," and this depends largely upon fineness of soil texture.

Cultivation breaks up the soil and causes larger granular surfaces to be exposed, and this surface becomes covered with water films.

The soil is deprived of its water by evaporation, transpiration of plants, and drainage.

The movement of water by capillarity tends to keep the soil moist at the surface, and thus aids the loss by evaporation. Such loss is lessened by repeated surface cultivation, as this breaks the continuity of the film of soil water; the top inch or so of soil becomes very dry and acts as a mulch preserving the water of the soil beneath.

Rolling the soil causes increased capillarity and, therefore, loss by evaporation, but the percentage of water in seed-bed is increased.

**Chemical Condition.**

By this is meant the amount of plant food in the soil, and in what condition that plant food is, viz.: available or unavailable to plants. The following are means of improving or maintaining the amount of available plant food in the soil:—

*Cultivation.*—By this means exposure of soil to the weathering action of the air converts some unavailable into available plant food.

*Fallowing* (crop).—Permits of an accumulation of available plant food.

*Rotation of Crops.*—By such system the soil is not depleted of any particular plant food, and plant food, owing to different root systems of different crops, is drawn from different portions of the soil.

*Addition of Humus.*—This will supply a certain amount of plant food, but more important is the fact that in decaying the organic matter (from which humus is derived) yields acids, which convert some unavailable soil material into available plant food.

*Addition of Manures and Fertilizers.*—By this means both slowly and quickly available plant foods may be applied to the soil.

*Liming* changes some of the insoluble plant food of the soil into an available condition.

*Drainage.*—This enables an increased depth of soil to be exposed to weathering agencies.

*Soil Acidity.*—The question of soil acidity may be mentioned under chemical condition.

Briefly stated there are different forms of soil acidity and, therefore, there is not a simple definition for this condition. Of late years soil acidity has been considered from the degree of hydrogen ion concentration in the soil. This is expressed by the number of litres of water that contain 1 gram potential hydrogen, such numbers being very large; for convenience logarithms are used, and these logarithms, ranging from 0 to 10, are known as the pH scale.

In the case of water which is neutral the pH value is 7. This means that $10^7$ (= 10,000,000) litres contain 1 gram of potential hydrogen in the form of ions. Smaller numbers indicate acidity. For example, pH 5.0 means that 1 gram of potential hydrogen in the form of ions in 100,000 litres—such solution is acid.

It has been stated that the extreme limits within which cultivated crops can grow are from pH 4.0 to pH 8.5; and that acidity of pH 3.0 and an alkalinity of pH 9.5 would kill crops.

Soil acidity may be rectified by the application of lime. In some cases the necessity of applying both lime and phosphate have been reported.

Some crops are more affected than others by soil acidity and respond differently to application of lime. Thus lucerne, peas, cabbage, and cherries are benefited by liming, whilst maize can grow in somewhat acid soil and is practically not affected by liming.

**Biological Condition.**

By this is understood the condition of the soil bacteria (useful and otherwise).

Organic matter applied to the soil is decomposed by means of bacteria, and most of the products of this decomposition are utilised by plants.

Those bacteria which cause unavailable nitrogen or nitrogenous compounds to become available to plants, and *vice versa*, have, perhaps, been most studied, and are termed respectively "nitrifying" and "denitrifying" organisms.

The following conditions are necessary for soil bacteria to obtain their greatest activity:—

(1) Fair proportion of humus in soil; (2) a warm climate; (3) good drainage; (4) a certain proportion in the soil of basic substances, such as lime.

That the humus content of the soil is a matter of very great importance has been emphasised in so far that the addition of humus has been mentioned as a means of maintaining or improving all three soil conditions—physical, chemical, and biological.

As the maintenance of soil humus is of particular value in our climate of somewhat irregular rainfall, a brief summary of the functions of this soil ingredient is given.

All organic vegetable and animal matter upon decomposition in soil yield complex residues such as humus.

In the improvement of tilth humus cements together the granules of a sandy soil and causes the fine particles of clay to flocculate. This lessens the shrinkage of clay in dry seasons and creates a more "crumb like" texture.

Its capacity of absorbing and also retaining water enables crops on soil well supplied with humus to better withstand the ill effects of dry spells.

In decomposing organic matter, besides providing plant food itself, yields carbonic acid to the soil water, which thus has the greater power of converting unavailable into available plant food.

The soil bacteria derive the growth energy required by them from the organic matter of the soil, and if this is lacking, the bacterial life—upon which soil fertility so largely depends—is decreased.

The increased effects obtained by applying farmyard manure, together with artificial fertilizers, depends upon the carbon dioxide evolved in decomposition of the organic matter of the manure increasing the solvent power of the soil water and also upon the action of bacteria in the manure.

Humus can be added to the soil by the addition of farmyard manure—ploughing in of all vegetable residues, and ploughing in green manure crops. Sufficient care is not given to the collection and the proper conservation of farmyard manure. Owing to present conditions a large number of men have turned their attention to market garden crops, and such crops for the most successful returns require intensive cultivation. As a foundation for such cultivation for these crops there is need for the application to the soil of good amounts of well-rotted farmyard manure and decayed vegetable matter to supply the humus so necessary for the successful growth of most garden crops. And the great value of collecting all waste plant material, preferably mixed with some farmyard manure, and keeping the mixture just moist in compost pit or heap, is a matter the value of which many cultivators have not sufficiently appreciated.

In connection with green manuring, leguminous crops are particularly valuable for ploughing under owing to the fact that these plants can assimilate the free nitrogen of the air by the aid of bacteria living in the root nodules of the legume.

The intention in briefly summarising the many factors that influence a soil's fertility was to again emphasise that in soil management it would be a mistake to unduly consider only one of these factors. For instance no amount of manuring will rectify the ill effects of bad drainage.

Finally the question of suitability of the soil to any particular crop is of importance, as it is impossible to obtain successful results from crops planted in soils of unsuitable texture with unsuitable climatic conditions, though such soils with other crops may prove entirely satisfactory.

# NOTES ON MAIZE CULTURE.

By C. J. McKEON, Instructor in Agriculture.

As the maize crop for the past season throughout the Southern portion of the State generally was light, and, incidentally, much of the grain harvested, particularly from the late crops, was not of the best quality, growers who have not saved their own seed for next season's planting would be well advised to secure their supplies early.

Supplies of good quality, true-to-type seed will be very limited and the demand, by reason of the fact that a large number of growers who usually save their own seed were unable to do so (owing to failure or partial failure of their crops) will be much greater than usual.

As a result of this anticipated shortage, much of the grain offered for seed purposes will be inferior to that which would be available following on a normal season; and apart from the fact that it will be of poor quality, much of it will also be of doubtful origin. Growers who intend purchasing seed would be well advised to pay attention to the following:—

1. Secure supplies of seed early and from some known reliable source. It would be much better to plant seed of some proved variety which is known to have been grown under conditions ensuring its varietal purity, even if slightly inferior in appearance as a result of adverse weather conditions under which it was raised, in preference to a more attractive looking sample of unknown origin, but which may have been grown under much more favourable seasonal circumstances.

2. Be sure that the seed has been tested for germination. Numerous complaints have been received by this Department, particularly following on a season such as last, regarding the failure of the seed to germinate. This has frequently been found on investigation to have been due to the fact that persons taking advantage of the shortage of seed have disposed of maize which has been tanked for lengthy periods for seed purposes.

## Preparation of the Land for Planting.

The time is now at hand when a start should be made on the preparation of the land for the early crop. It is one of the easiest crops to grow, and, unfortunately, advantage is frequently taken of this fact, and many crops are grown under conditions which would be fatal to many other crops.

To get the best results maize requires a good soil, in which a plentiful supply of plant food is available, a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least 9 inches during the winter, and allowed to lie in the rough until the early spring. The action of the frost and rain will have a sweetening effect on the soil, and will leave it in a mellow condition. In the early spring the land should receive a second ploughing, which, if possible, should be a cross ploughing. This should not be so deep as the first ploughing, and should be immediately followed by a harrowing and cross harrowing to work the surface soil into a nice fine condition.

If a crop of weeds is turned under during the second ploughing planting should not be carried out for a few weeks at least to allow decomposition to take place. On land which is not too heavy and moist this will be greatly assisted by rolling, as the rolling will consolidate the soil and cause the decomposition to take place much more quickly. It will also at the same time make a good firm seed bed. Rolling should always be followed by a light harrowing.

The preparation of the seed bed is one of the most important points in the production of maize, and no amount of after cultivation will undo the damage that has been caused by planting in a badly prepared piece of land.

One has only to see the difference, not only in growth but in the colour of the foliage also, between crops grown side by side, and where one has been sown on thoroughly prepared and the other on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a good seed bed—and by a good seed bed is meant not only a well-prepared one but one in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

**Time to Plant.**

The best times to plant will naturally vary according to the different districts. In districts which have a long growing season and a comparatively regular rainfall, this can be carried out whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district in which it is to be grown; and secondly, to try and have the crops tasselling during periods in which there is usually a good chance of getting rain. Maize must have moist conditions during tasselling, and if hot dry winds occur during this period the pollen is destroyed and fertilization cannot take place.

Seed should be sown in drills spaced from 3 feet 6 inches to 4 feet apart—nothing less than 4 feet for the tall-growing, late-maturing varieties. As a general rule, single spacing gives the best results, the grains being dropped singly along the rows, with a distance of approximately 12 inches between the grains for the quick-maturing varieties and from 15 to 18 inches for the late-maturing varieties.

From 9 lb. to 10 lb. of seed is sufficient to plant an acre when sown in this manner.

The most satisfactory method of sowing is with a seed drill, as in this way it is possible to get a good even spacing, and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

**Field Practice.**

The land can be lightly harrowed even until the plants are a few inches high. This will not only destroy young weed growth but will also greatly improve germination in the event of heavy rain falling shortly after planting and causing the surface soil to become caked. Many growers are afraid of injuring the young crop, but if harrowing is done on a bright warm day, when the young plants are not brittle, and care is taken to prevent dragging of rubbish which may collect under the harrows, the crop not only will not be injured but will be greatly benefited.

In districts where the rainfall is heavy, and difficulty is experienced in keeping weed growth in check, many growers before planting run out shallow drills a few inches deep with a light plough or other suitable implement, and then sow along the bottom of the drills with the planter. When the young plants are high enough the cultivator is worked through the rows, and is set in such a way that the soil is drawn in around the plants, filling up the depression made when drilling, and thereby smothering the young weeds which have sprung up in the rows. This, of course, to be effective must be done while the weeds are very young.

During the early stages of growth the crop should receive at least two good inter-row cultivations to keep weed growth in check and to keep the surface soil in a nice friable condition, and on no account should the surface soil be allowed to remain in a caked condition while it is possible to work a horse cultivator in the rows.

**Harvesting.**

The picking of the crop still remains a hand operation, and although machines have been tried, one of which was invented and built in Queensland and which performed well at the trials, none of these have so far reached a stage where they can be successfully worked in the majority of crops.

The ears should be allowed to dry out thoroughly before being shelled, for, apart from the fact that the grain if shelled too early is likely to heat in the bags, a large amount of grain is broken and damaged during the shelling process and the appearance of the sample is spoiled. A considerable wastage also occurs through the cores being too soft to withstand the pressure of the drums, and these break up into small pieces and pass out through the machine with the grain still attached.

**Cost of Production.**

To make maize-growing profitable the cost of production has to be reduced to a minimum, and this can only be done by increasing the yields by the use of pure strains of seed which have proved suitable for the locality, and also by practising the best cultural methods. Good quality seed not only gives an increase yield per acre, but also an increased return per bushel, as a better price will always obtain for grain which is of good even type and colour.

The use of modern machinery also plays a very large part in lessening the cost of production, and hand work must be eliminated wherever possible, and the combined husker and sheller has done a great deal towards this.

**Storage.**

Maize can be stored for very long periods at no very great cost other than the initial cost of the tanks, yet growers frequently dispose of their entire crops for very low prices during flush seasons; whereas if they had the storage accommodation, and, of course, were in a financial position to store their grain for a time, they would receive very much better prices. One thousand gallon tanks are very suitable for this purpose, and hold approximately 3½ tons of grain. The lids of the manhole and shoot should be so constructed that they can be made quite airtight by puttying or by the use of puddly clay. First and foremost the grain should be thoroughly dry, and should not contain more than 14 per cent. of moisture at the time it is placed in the tank.

If the grain is showing signs of weevil it can be fumigated by placing a couple of saucers on the top of the grain and pouring into these 1½ to 2 lb. of carbon bisulphide. Place the lid on as quickly as possible and puddle up the edges of the manhole cover to make it perfectly airtight. The tank should be kept sealed for twenty-four hours, or longer if desired, and then remove the lids from the manhole and discharge shoot and cover the discharge shoot with strong gauze to prevent the grain from running out. After forty-eight hours the covers can be put back. Grain for seed purposes should not be left for such a long period, and should immediately after fumigation be exposed to the air, otherwise the germination may be seriously affected.

Carbon bisulphide is highly inflammable, and care should be taken to see that no lighted pipe or other light is near the tank when the fumes are released.

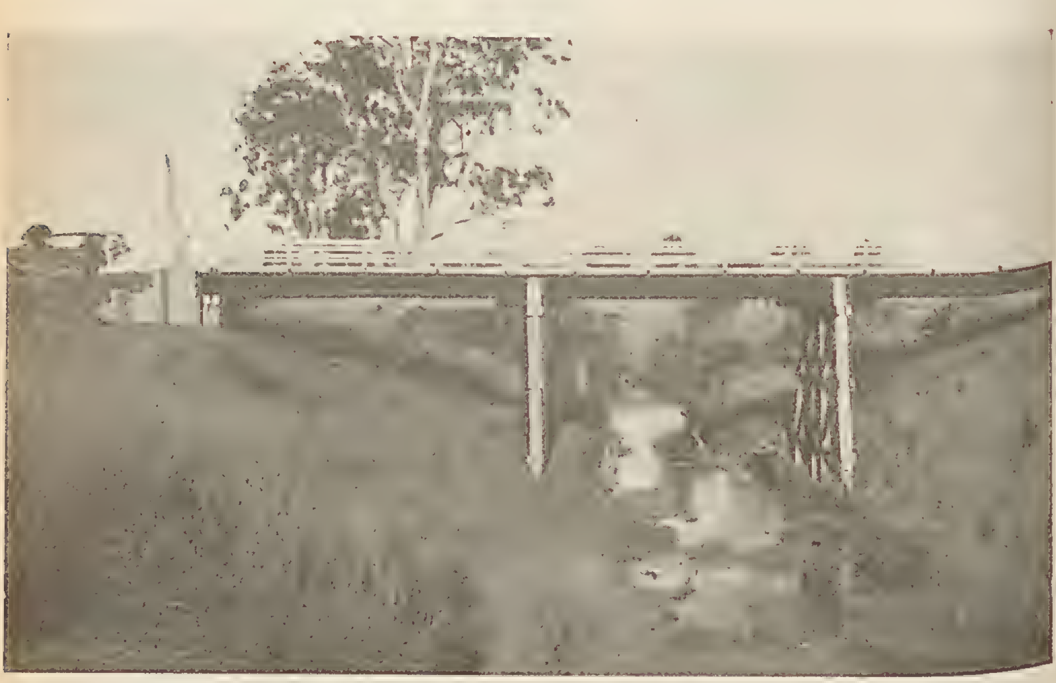

PLATE 8.—TIMBER BRIDGE AT MCLEAN'S CROSSING, BRISBANE-WARWICK ROAD.

*Blocks by Courtesy Main Roads Commission.*]

# SHEEP BREEDING IN QUEENSLAND.

By J. CAREW, Senior Instructor in Sheep and Wool.*

THE breeding of sheep in Queensland is confined almost entirely to the Merino for wool production.

The enormous area of country in which the breeding and pasturing of sheep is the chief industry, embraces such a variety, conditions of soil, rainfall, edible weeds, herbage, shrubs, and grasses that it can be fully appreciated that all our sheep country is not adapted for purely breeding purposes.

An average in the vicinity of 5,000,000 lambs are reared in Queensland each year. In many areas, and over a great variety of country, these grow into a well-developed wool-growing type. Flock rams are introduced chiefly from New South Wales, and much of the improvement showing in the general run of our flocks is due to their influence. This improvement is increasing the confidence of Queensland graziers, who realise that the country and pastures are capable of producing the type in keeping with their own ideas. Many breeders scattered over an area extending from the border of New South Wales to the North-Western Queensland are now breeding their own rams, both for their own use and for sale, while others are coming into prominence through their establishment of special studs of high quality. This is as it should be, but there is plenty of room for flock improvement and the maintenance of a high standard of quality.

The introduction of high quality stock is always an advantage if they are of the proper type, provided that they carry the pure blood of that type, though in this particular phase of sheep breeding many disappointments are met with. It is not the introduction of fresh blood that counts for improvement, but the right strain which possess the power of prepotency—that is the power possessed by some animals of stamping their characteristics upon their progeny. Most of the cases of prepotency are merely the operation of Mendel's law of dominance.

## Mendel's Work.

Gregor Mendel, in 1866, published the results of eight years' experimental work, which received little attention at the time and was soon forgotten, but was again discovered simultaneously in 1900 by three different scientists, Correns, von Tscharmak, and de Vries, working independently in three different countries. Mendel discovered that inheritance is governed by certain laws—namely, those of unit character, independent assortment, segregation, and dominance. When a sire of high quality of the desired type is discovered to possess this power of dominance or prepotency, his value should be fully appreciated. It is only the keen and attentive sheep-breeder that takes particular notice of all the points in the young sheep, who will be able to trace this special feature to the sire, therefore, close observation is essential.

## Flock Improvement.

When commencing on a method of flock improvement, it is necessary first to choose the most desirable type likely to prove suitable to the existing local conditions where they are to develop; second, to watch carefully for the sires that are dominant, and produce true to type; third, to keep flock books in order that the history and pedigree of prominent strains may be watched; fourth, when pure lines are established, see that they are maintained by breeding on right principles; fifth, if fresh blood is introduced, be careful to have it pure, and not extreme in type, as pure breeds transmit their characters with greater uniformity. Each year the system of selection should be carefully observed, selecting the best and rejecting the rest. The ideal should be pictured in the mind's eye, which, when once secured, should be maintained as far as possible.

As man's ideas of improvement in sheep may not always be in keeping with nature's ideas, some disappointment may therefore be expected.

The occurrence of black sheep in purebred flocks is an instance of reversion, even when it is definitely known that no black sheep have been in the flock for generations. This phenomenon is known as atavism, and can be completely eliminated by culling out the recessive characters.

Each individual inherits from its parents independent and separable characteristices, each of which is a distinct unit, so that it may occur in any combination with other characteristics. Much attention during recent years has

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* In a radio lecture from Station 4QG.

been given to that form of cell structure known as the chromosomes. Every chromosome according to this theory contains actual material substance, and represents specific characteristics. Among the many names given to these material substances are factors and determinants which influence heredity, and may effect many characters. For each character the individual inherits two determinants, one from each parent. One of the determinants is stronger than the other, and is known as a dominant, while the weaker of the pair is known as a recessive, and may not be evident in the individual.

In the degree of dominance, sex has an effect as illustrated by the presence of horns. It is rare that Merino rams are without horns, but the great majority of Merino ewes are hornless. Both sex of the Dorset Horn breed are horned, while both sexes of the Southdown and Shropshire are hornless. When the Dorset Horn and the Southdown are mated all the rams produced are horned, and all the ewes are polled. This indicates that the horned characteristic is dominant in the male, and recessive in the female.

When the progeny of this first cross are mated, both horned and polled sheep will result. In the ram section, approximately three will be horned to the one polled, while there will be about three ewes polled to the one horned.

Various degrees of dominance as regards colour is also in strong evidence, as instance the white and dark faced English breeds. The Cheviot, which has white hair on the face and legs, when mated with the Southdown, which has brown hair on both face and legs, the progeny will have grey hair on those parts. This intermediate colour between the two will take two crosses to the pure breed of either side to regain the original colour. These two factors of horns and colour are easily detected and are useful for comparative purposes. Where the wool covering is the chief aim for improvement, as in the Merino, the variation is difficult to detect in length, character, quality, and denseness of fleece. All these factors, as well as the frame form constitution and development, are closely associated with success in breeding.

## Methods of Breeding.

Many terms are applied as to the methods of breeding, such as in and inbreeding where all relations are mated. Close breeding is a term used when the system is similar to the above, but adhering to close relationship. Both these methods are likely to cause a development of good or evil, for if both possess good characters these are intensified just as bad characters show further defects.

Up to Bakewell's time, any form of in or close breeding was regarded with suspicion, and likely to cause defects and deformities. Bakewell's success and Mendel's principles applied in sheep breeding, altered the methods previously adopted of out breeding—that is, introduction of fresh blood, principally sires, each year. Line breeding is regarded by many as similar to inbreeding, but in practice it should be followed on the principle of sire to daughter, and the pick of the young rams to the parent flock, until the fourth generation.

The best ram from one flock is then selected and mated with the pick of the ewes of the other flock, and the breeding continued on these lines. In the progeny there are always fixed types if it is possible to pick them out, and it is in this respect that the gifted breeder can detect that quality. Local conditions and environment also have an important influence on successful sheep breeding.

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**TO SUBSCRIBERS—IMPORTANT.**

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

# THE IDEAL PIG.

By Officers of the Department of Agriculture and Stock, Brisbane, Q.

PIG-RAISERS are frequently confused in the matter of selecting the correct types and breeds of pigs to produce their baconers and porkers, and the object of these notes is to place before Queensland farmers something definite about the pig trade requirements and how they may be met by careful attention to the breeding of pigs.

The information herein is given after careful consideration of all the available evidence of breed tests and performances both here and abroad. It must be noted from the outset that, although the matter of "breed" is important, it is not nearly so important to the pig-raiser as the matter of individuality within the breed; also feeding and management of the pigs have a vast effect on their inherent characteristics. The best bred pigs can be spoilt by incorrect feeding and by bad management, and farmers are sometimes inclined to pay too much attention to the breeding of their pigs in comparison to the attention they give to improving their methods of feeding and general management.

Wherever one goes, he hears the question: "What is the best breed or cross of pigs?" The answer at present is that, "There is no best breed or cross of pigs, but several breeds and crosses of pigs give satisfaction in that they meet the requirements of the farmer as well as the bacon curer, pork butcher, and the consumer." Firstly, one must consider the trade for which he intends to cater. The pork trade, the Queensland bacon trade, and (if it should come our way) the English bacon trade, all require the same conformation and proportion of fat and lean in the pig's carcass, but each of these trades requires the "finished" pig at a different weight. A description of the ideal carcass for any of these trades is as follows:—

A fleshy pig, with a comparatively light covering of fat; the flesh and fat being of fine texture and firm, and should harden under ordinary chilling treatment; in conformation, the pig should be comparatively light in the shoulders, neck and jowl, and head; the middle should be comparatively long and fairly deep with ribs well sprung, but not bulging into a rounded barrel; the back should be slightly arched, and the belly line straight but full. The hams should be fleshy, well rounded, deep and broad. The skin and the legs should denote fine quality.

The most desirable weights are—(*a*) For porkers, 60-80 lb. dressed; (*b*) for Queensland baconers, 95-120 lb. dressed; and (*c*) for the English bacon trade, heavier carcasses are required, pigs dressing 130-160 lb. usually realising highest price per pound.

The ideal pigs can be pointed out when alive with a reasonable amount of accuracy, and for the breeder's purpose it is necessary that the ideal pigs should be discernable while alive.

For the farmer's purpose, the ideal breed or cross, type or strain of pig, is the one that will give him the most pounds of meat of good quality in the shortest time with the least cost.

Now, to consider the various pure breeds of pigs with which we have to work, and to attempt to lay down some more or less definite plan to which breeders may direct their operations. Although there are variations in all breeds of pigs, we can in a general way, class our breeds of pigs into two fairly distinct types, viz.:—(*a*) The smaller, quicker-maturing porker type, and (*b*) the larger, later-maturing bacon type.

Early maturity (with which is associated early fattening) must not be confused with fast growth which may be found in either late or early maturing animals. Maturity means that the animal has finished its development, at which stage it usually fattens rapidly. Fast growth means that the animal grows rapidly, although

it may not be fattening. To have an abundance of lean meat it is necessary to have the animal growing rapidly, but not fattening; therefore, to produce the ideal pig which is in a ''finished'' condition, but not too fat, when it reaches the most desirable trade weights, and which has grown rapidly, it is necessary to use the correct class of breeding stock. For the production of light-weight porkers, the early-maturing breeds are quite satisfactory, but if this class of pig is grown on rapidly to either local or export bacon weights, it will give a thick and overfat carcass; this is a common mistake made by pig-raisers. DON'T TRY TO MAKE A BACON PIG FROM A PORKER, AND DON'T TRY TO MAKE A PORKER FROM A BACON PIG.

To produce the export baconer, the larger, late-maturing class of pig suits admirably, but if this class of pig is marketed at porker weights or at Queensland baconer weights, it is ''unfinished,'' and does not give a meaty and attractive carcass.

A problem is presented by the Queensland bacon curers who require their ''finished'' pig at an inconvenient weight. The smaller class of pig, if used to produce bacon, must either be grown very slowly to baconer weights or give an overfat carcass, while the larger class of pig, if marketed at 95-120 lb., gives a very rangy carcass which is usually lacking ''finish.'' So it is a medium class of pig which is required, and this class must be produced either by (i.) selective breeding of either the more lengthy pigs of the smaller class or the more compact pigs of the larger class; or (ii.) by crossing the pigs of the smaller type with pigs of the larger type, which is the general practice with Queensland pig-raisers.

Of the breeds in common use in Queensland at present, the Berkshire and the Middle White are typical early maturing pork breeds, while the Tamworth and Large White are typical late maturing bacon breeds.

Individual animals and families vary, but the more typical representatives of these breeds fit into these classes. It might be repeated here that selection of the most desirable individuals within each breed is even more important at times than the selection of a breed, as individuals vary to a great extent.

**Where cross-bred sows of medium type are in use on the farm, they should be mated with boars of the larger class for the production of baconers, and with boars of the smaller class for the production of porkers.** When we speak of the smaller class of pig it is not meant to imply that a very small class of pig is desirable. From the pig-breeder's point of view, size of the individual within the breed is a most important characteristic. A good-quality big pig is better than a good little pig.

Fineness of bone must be sought in the selection of stock, and in this respect the Berkshire, Middle White, Tamworth, and Large White breeds are particularly good. The English pork and bacon markets and the local pork market have a distinct preference for white pigs, and when these markets are being specially catered for the Middle White and Large White breeds—either as purebreds or for crossing—must receive consideration. The progeny of white pigs are white even if the one white parent is mated with a black or red animal. It might be mentioned with regard to white pigs that while they are reasonably hardy, their skin will soon become unhealthy if they are exposed to insanitary conditions or to parasites, such as lice and mange.

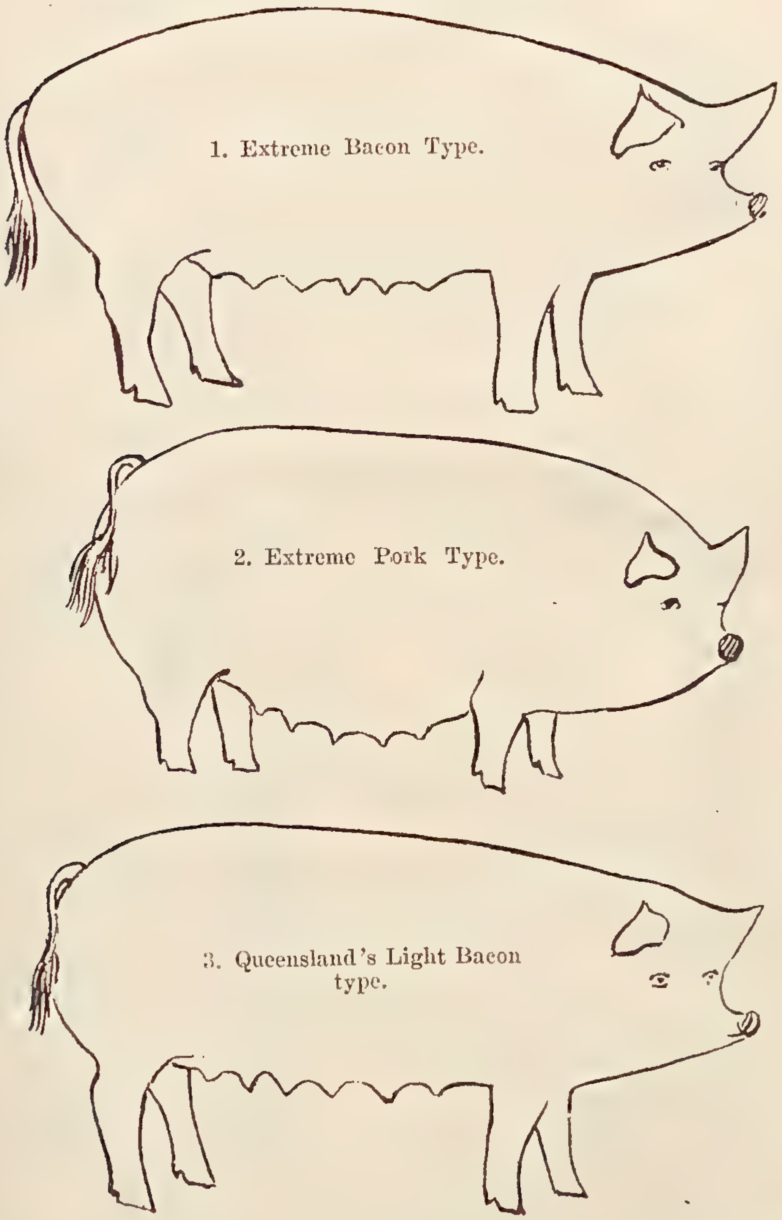



Plate 9.

The above diagrams illustrate adult pigs of the larger and smaller types, as well as the medium type which suits the Queensland bacon trade.

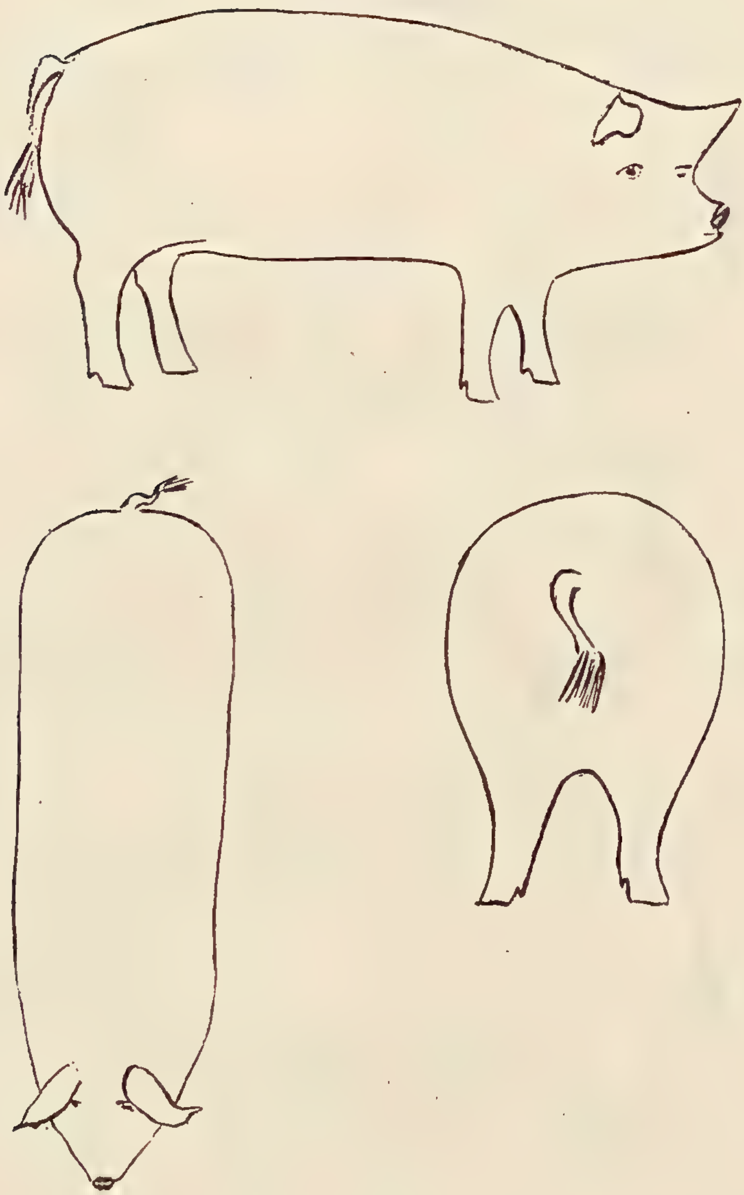


PLATE 10.

Diagrams showing side, top, and rear views of a good type of pig carrying the required proportion of the most valuable parts of a carcass. The ideal conformation to be aimed at by the breeder of porkers and baconers.

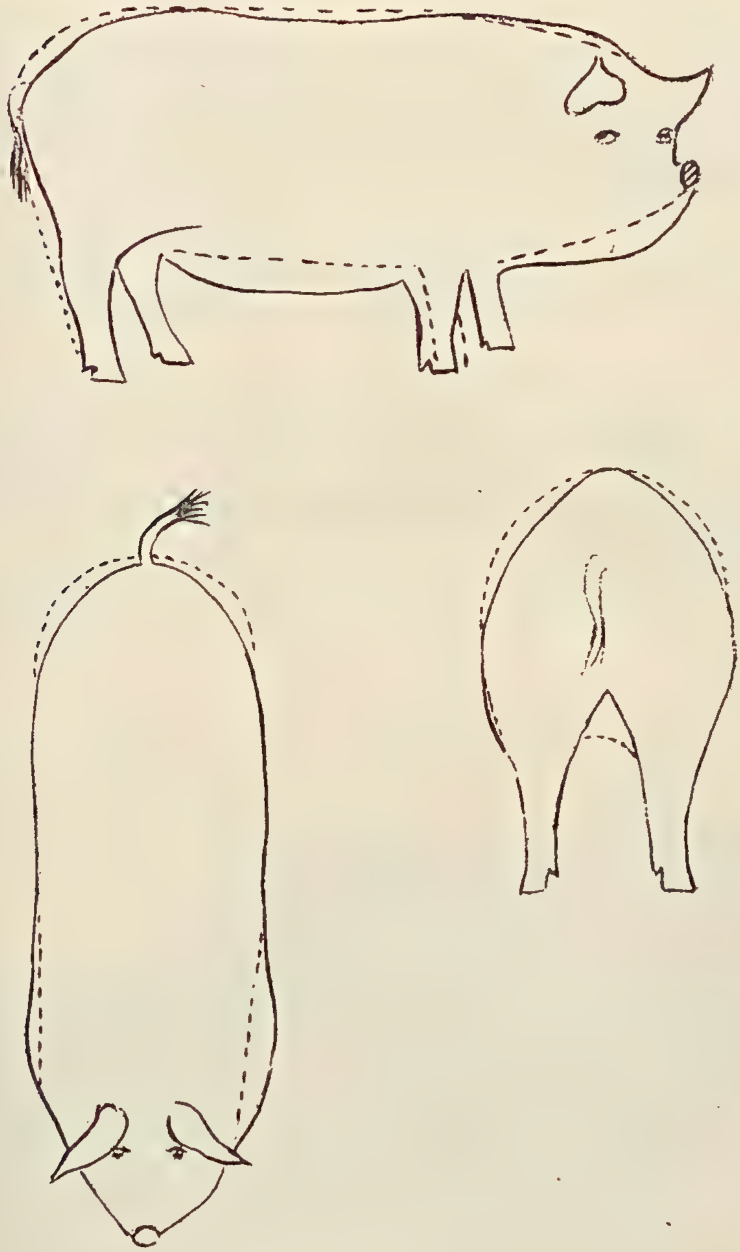


PLATE 11.

Diagrams showing side, top, and rear views of an undesirable type of pig. Comparison of heavy lines with dotted lines shows where this type departs from the ideal.

# FRUITGROWING IN NORTH QUEENSLAND.

## QUARTERLY REPORT.

### Fruit Crops, Citrus.

Of the country between Cooktown and Townsville the Cairns district will produce the heaviest crops of both oranges and mandarins this year.

Locally grown oranges of excellent size and flavour were being sold on the Cairns market as early as the first week in March. Sales were quite satisfactory.

Local mandarins did not come on to the market until the third week in March and, although not carrying the quantity of sugar that the oranges contained, realised a fairly satisfactory price.

A very interesting fact is the tremendous crop of Emperor mandarins being carried by two-year old trees growing on Mr. Polentz's farm at Edge Hill, Cairns, proving that, with the conditions that exist in these Northern centres, citrus-growing could be advanced to a much greater degree of productivity than it is at present. It also proves that the Emperor mandarin is the most suitable variety for this district.

The bulk of the Northern citrus crop, both mandarins and oranges, could be completely marketed during the months of March and April if properly coloured.

Means of transport have improved beyond imagination, when compared with the conditions existing in the days when the old citrus orchards throughout these districts were first planted, in the hope that they would be a commercial success. Unfortunately, the locally adopted methods of cultivation, orchard control, and marketing have not grown apace with the improved methods of transport that are so much in evidence to-day.

Local lemons of excellent quality are being marketed at present and are realising very satisfactory prices. The season prevailing throughout the term appears to have suited the lemon crop admirably, and it would be quite a difficult task to find lemons of better quality.

### Pineapples.

Very few pines were marketed during the quarter; consequently it was necessary for local fruiterers to import their pines from the Nambour-Woombye areas as well as a few consignments of Northern Tableland pines.

### Granadillas.

Granadillas are still scarce, only odd consignments coming on to the market each week.

### Passion Fruit.

Practically no passion fruit has been marketed from off the coastal areas. Fruiterers have secured their supplies either from the Brisbane markets or from the Tableland areas where, during any season other than the winter period, passion fruit thrives.

### Papaws.

The usual quota of papaws have been marketed, realising a standard price of approximately 4s. per dozen wholesale for good fruit. It is interesting to note that during the early part of this year numerous areas were planted out with seedlings produced from excellent fruiting varieties.

### Mangoes.

January saw the final harvesting of our mango crop. The prices then were quite sound.

### Bananas.

During the first quarter of the year practically no bananas were sent South. The Northern demand was capable of absorbing all locally grown bananas, and fruit of decent size and quality met with a profitable and ready sale in any of our local centres. A few new areas have been planted, and fully considering the rapidity with which the present bearing plantations are nearing their commercial end, the prospects ahead for the owners of new plantations, look very favourable at present.

**Grapes.**

In February the main Tableland grape season closed. A satisfactory crop was harvested.

**Temperate Fruits.**

During the month of January and the early portion of February an excellent crop of plums was harvested from some of the small orchards in the Tableland area. Apart from fruit-fly, no losses were accounted for, and practically every sound fruit harvested was readily sold. The appearance of the trees at present give every indication of them undergoing a long dormant period. Should a few beneficial showers fall in the early spring, there is no doubt that a good crop will naturally follow. It is reputed that one individual grower with quite a small orchard, in this district, made £500 off his plum trees last season.

**Melons.**

Melons of excellent quality and flavour were marketed up till as late as the end of February, and it was then only owing to the excessive wet that the vines ceased production.

**Custard Apples.**

Custard apples had a particularly good run this year, and locally grown fruit was noticeable in fruiterers' windows at late as the end of March.

**General Progress.**

A considerable progress has made itself manifest, particularly in regard to pineapples, papaws, and bananas, the plantings of these fruits being the outcome of a desire to supply the local market only.

PLATE 12.—LAUNCHING THE FIRST GIRDER.
Beatrice River Bridge in course of construction, on the Eacham-Millaa Millaa-Innisfail Road, North Queensland.

## BANANA PLANTING.

AFTER giving the matter full consideration, the Banana Industry Protection Board unanimously decided to recommend the same planting policy as that which gave general satisfaction during the past planting season.

The suggested policy has now been approved by the Minister (Mr. Frank W. Bulcock), and is as follows:—

**Outside the Quarantine Area.**

With regard to that portion of the State outside of the quarantine area—

No permit shall be issued to the occupier or owner of a neglected or abandoned plantation nor for planting in close proximity to a plantation badly affected with bunchy top.

**Within the Quarantine Area.**

(*a*) No permit shall be granted to an applicant whose plantation at the date of application, either wholly or in part, is in a neglected condition, or has at any time during the preceding six months been known to be so and/or where such neglected condition has not been rectified without pressure from an inspector.

(*b*) No permit shall be issued in respect of any plantation in which bunchy top has appeared during the preceding four months. Exemptions from this clause may be granted by the Board under special circumstances.

(*c*) In general, permits shall not be issued for any area or areas which will bring the total acreage under bananas for any one owner or occupier in excess of 8 acres, unless by special permission of the Board.

(*d*) Planting of new areas by persons not at present established in the district is undesirable, and permits for such planting will only be granted by the Board under very special circumstances.

(*e*) Any plantation in which bunchy top is found discernible in the third leaf from the top of the plant shall be classed as a neglected plantation, and dealt with as such.

With regard to the securing of suckers, the recommendation is as follows:—

A.—In any clean districts suckers must be free from bunchy top, beetle borer, and thrips.

B.—In any case the removal of suckers from plantations where thrips are prevalent will be permitted only in cases where it can be demonstrated that clean plants cannot be obtained from a clean area and where the suckers are dipped in a solution of nicotine sulphate under the supervision of the Board's agent for the district.

B1.—The Board may, at its discretion, waive the application of clause B wholly or in part, insofar as any particular agent's district or portion thereof is concerned.

C.—In a district affected with beetle borer but no bunchy top, suckers can be moved within the district, provided the agent considers the plantation the suckers are being taken from is reasonably clean.

D.—In the area from the Maroochy River northwards, which is free from bunchy top, suckers may be obtained from reasonably clean plantations in the district, but the source of supply must be first inspected and approved by the agent of the Board.

E.—The condition of the plantation and locality to which the suckers are to go should largely determine the origin of the suckers.

F.—As far as possible the suckers for planting any new areas should be obtained from clean districts.

G.—*Quarantine Area.*—Suckers for planting in the quarantine area may be obtained from clean plantations in the area which have never been infected with bunchy top, or from clean plantations outside of the area.

H.—*South of the Quarantine Area.*—Growers may plant suckers from their own plantations where disease has been satisfactorily controlled or from—

- (*a*) Plantations where the grower has made a continued and successful effort to control bunchy top;
- (*b*) From within his own immediate locality, from approved plantations on which disease has been satisfactorily controlled;
- (*c*) For a new plantation, suckers may be obtained from an area free or reasonably free from bunchy top and beetle borer approved by the agent concerned;
- (*d*) In isolated localities free, or only very lightly infected, suckers shall be secured from within that area or from an area free from both bunchy top and beetle borer.

## SUDAN GRASS.

*The Minister for Agriculture and Stock, Mr. Frank W. Bulcock, has received the subjoined memorandum from the Officer in Charge of the Pure Seeds Branch (Mr. F. F. Coleman):—*

FROM the 1st July, 1932, up to and including the 31st May, 1933, no fewer than 182 samples of *Sorghum sudanese* seed were examined. Out of this large number 97 samples contained the poisonous seeds of Datura spp. which are totally prohibited under the Seeds Acts.

Several samples were under the low standard of germination prescribed, which is 70 per cent. Many samples contained a greater proportion or quantity of inert matter and weeds seeds than is allowed. Later in May several complaints were made regarding samples of Sudan grass that were submitted by farmers to merchants. One merchant alleged that such a sample probably contained Johnson grass. This complaint necessitated an examination of the farmer's paddocks, also the taking of an official sample from seed held by him. The paddocks in question were infested with *Sorghum halepense* (Johnson grass) and one of the samples contained a trace of the poisonous seeds of Datura sp. as well as the dreaded seeds of *Sorghum halepense* (Johnson grass).

It is frequently overlooked that all forms of sorghum contain more than a trace of hydrocyanic acid during the young stages of growth—in particular, forms of *Sorghum vulgare*, or the common sorghums of commerce. Johnson grass (*Sorghum halepense*) is a stoloniferous rooted form of fine-stemmed sorghum. The leaves of Johnson grass are particularly high in hydrocyanic acid. Unfortunately, Johnson cannot be readily distinguished from the fibrous rooted sorghum, *Sorghum sudanese*. Owing to the roots which develop with Johnson grass it is possible for this plant to produce young leaves in practically any part of the year, if sufficient moisture is present. Such leaves have a high hydrocyanic acid content and probably on many occasions have caused loss of stock.

Unfortunately, samples from some districts frequently contain the poisonous seeds of Datura which is an evil-smelling, large, coarse-growing plant that could easily be eradicated if the paddocks were carefully gone over to prevent the plant seeding. Such seeds may not always germinate the first year. It is therefore possible that weeds of the year before last may produce Datura plants next year. The leaves of Datura are poisonous and the seeds are highly poisonous, and when such material is chaffed up animals do not have an opportunity to reject this plant, as they would do when grazing in the open.

It has been necessary to issue a warning in the press against the presence of *Sorghum halepense* in Sudan grass samples, and repeated attention has been directed to the poisonous properties of Datura.

Many large quantities of *Sorghum sudanese* seeds have been rejected by the other States on account of their weed seed content. Although some merchants, both at Warwick and Toowoomba, are equipped with efficient seed-cleaning machinery, such machinery cannot entirely remove Datura from millets, Canary, or *Sorghum sudanese*. Further, it would be impossible to entirely remove the seeds of Johnson grass.

It has frequently been said that better seeds mean better crops. Although this is true, the farmers should realise that better cultivation will lead to better seeds and ensure crops of such a character that they will produce seed that, after machine cleaning, would comply with the low standards prescribed by the Regulations under the Seeds Acts.

## CARE OF CREAM.

The care given to cream on the farm and during transit is of considerable importance in relation to its grading, and any of the following practices may be responsible for it being classed as of second quality:—Failing to stir cream with a metal stirrer. Failing to blend each separating as soon as cool. Keeping cream in untinned or rusty receptacles and unsuitable containers, such as benzine tins—the can in which the cream is to go to the factory is the best container to store cream in. Failing to send in the morning's separating on cream-delivery day. Keeping small quantities of cream back and sending in next cream-delivery day. Failing to protect cream in the dairy from flies and vermin. Mixing warm cream with cold. Failing to keep cream cool whilst in the dairy. Exposure of cans to the direct rays of the sun, either on carts, at the roadside, or on vans and launches en route to the factory.

## ARTIFICAL MANURE SUBSIDY.

PART VII. of the *Commonwealth Relief Act*, No. 64 of 1932, provides for the payment *to primary producers* throughout Australia of a subsidy of 15s. per complete ton of artificial manure used by such primary producers in the production of primary produce other than wheat during the year ending 30th November, 1933.

This means that, providing a primary producer has applied to the soil during the period 1st December, 1932, to 30th November, 1933, one ton of artificial manure in connection with the production of any primary product, *except wheat*, he will be eligible to claim 15s. subsidy. If he has used two tons during that period he will be eligible to receive 30s., and so on; but if he has used less than one ton no subsidy is payable, as the Act prescribes that, in calculating amounts of subsidy, fractions of a ton shall be excluded.

The financial assistance in regard to the use of artificial manure applies to primary producers in respect of every product except wheat. Special provision has, of course, been made for wheatgrowers under Commonwealth grants distributed by the States. Producers of oats, barley, hops, beans, apples, pears, citrus fruit, tobacco, &c., will therefore be eligible to claim the subsidy, which will also apply to artificial manure used in top-dressing of pastures.

Artificial manure for the purposes of the Act is any substance which contains nitrogen, phosphoric acid, or potash, and which has been manufactured, produced, or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to plants; but does not include any animal or vegetable matter which has not been subjected to process or manufacture.

All the fertilizers registered at the Department of Agriculture and Stock, Brisbane, under "*The Fertilizers Acts*, 1914 *to* 1916," are artificial manures for the purposes of the Commonwealth Financial Relief Act, with the exception of lime on which the Commonwealth subsidy is not payable.

Applications for the subsidy must be made *in ink* by primary producers on a special form, and these applications will require to be completed by the primary producer and sent by him to the supplier of the artificial manure for his certificate as provided on the form. The supplier will then send the application to the Fertilizer Subsidy Section of the Department of Commerce in the State in which the fertilizer has been used. Queensland claims will be sent to the Department of Commerce, Desmond Chambers, 303 Adelaide street, Brisbane. Forms of application have been distributed to country post offices. Any primary producer who may experience difficulty in securing a form should communicate with the Department of Commerce, Brisbane, where a reserve supply of forms is held.

It will be noted that primary producers are not eligible to submit applications for the subsidy until they have actually used the artificial manure in regard to which they desire to claim financial assistance. They should use the full quantity of artificial manure which they intend to apply in regard to any particular product before submitting an application. They should not submit a claim in regard to a portion of the quantity used and then submit one or more claims in regard to the remainder. The Department of Commerce hopes that in most cases it will be necessary for only one claim to be made by primary producers, but it is recognised that in special circumstances two claims may be necessary.

The declaration to be completed by applicants for the subsidy as shown on the form of application must be made in the presence of either a commissioner for declarations, a justice of the peace, bank manager, postmaster, station-master, or constable or officer of police. No other official is authorised to take this declaration.

Primary producers are requested to exercise every care in completing their claims so as to ensure that they claim the subsidy only in respect of artificial manure *used* during the period 1st December, 1932, to 30th November, 1933. If the artificial manure was applied to the soil prior to 1st December, 1932, no subsidy is payable. It must also be used prior to 30th November, 1933, to be eligible for the subsidy. All the particulars asked for on the form of application must be filled in by the applicant; otherwise delay will be caused in finalising the claim owing to the necessity of returning claims to primary producers for completion or correction.

## FARM PRODUCE AGENTS ACTS—IMPORTANT PROVISIONS.

IN the last session of Parliament several important features were incorporated in the Farm Produce Agents Acts.

The Acts as they now stand afford ample protection to the growers in their dealings with agents and, at the same time, they raise the status of the agetn, as the "man of straw" who came and went, leaving a trail of dishonoured cheques in his wake, will not be able to obtain a license.

Perhaps the chief of the amendments is that which requires the agent to provide a fidelity bond prior to his obtaining a license to trade as a farm produce agent. In the event of an agent's default his bond may be estreated and the proceeds utilised to meet the claims of unpaid growers.

Agents are required to forward account sales within fourteen days, and to pay the consignor within thirty days of the date of sale of the produce. This latter obligation still stands, although the agent has not been paid by the purchaser.

It will be seen that the grower is in an advantageous position in this regard, and runs no risk of bad debts, the responsibility for collection of payments for produce sold being transferred to the agent.

In addition to the recognised agent, there was another class of trader carrying on ostensibly as a merchant.

Now a merchant buys his produce outright, the price being mutually agreed upon between himself and the producer, his profit arising from the better price at which he expects to sell.

The trader now referred to was not trading along those lines. His practice was to receive goods and fix the price himself without reference to the grower. Such a price might be fixed after the receipt of the day's quotations, or even after the sale of the produce. This class of trader accepted neither the risks of the merchant, nor the responsibility of the agent; clause 5A of the Acts was designed to stop this practice. The price of farm produce must now be arranged with the producer at the time of purchase, or before delivery is accepted, whichever date is the earlier.

When produce is sent to an agent for sale on behalf of the producer, this provision does not apply.

Several cases have recently come under the notice of the Department where farmers, in response to, perhaps, a circular letter or an advertisement, have consigned produce under the impression that they were dealing with an agent to find the consignee, later, denying that he had acted as agent.

Growers should protect themselves to the extent of seeing that the person to whom they intend forwarding their produce is either a bona fide buyer or an agent who holds a license under the Farm Produce Agents Acts.

*List of Licensed Farm Produce Agents, Brisbane.*—Addis Bros., Allen, Joseph, Anderson, Edward Arthur, Archer and Goss, Arkell, W., and Sons, Australian Fruit and Produce Co., Ltd., Barnes and Co., Ltd., Barr, Alexander S., Barron, Orr, and Co., Ltd., Barter, G. and W., Bowden, T. S., and Co., Brabant and Co., Burrell, Fenton, and Co., Pty., Ltd., Carseldine, Arthur W., Carter, Alfred J., Chave, Alfred E., Clark and Jesser, Collard and Mackay, Comino Bros. Ltd., Committee of Direction of Fruit Marketing, Cooksley, John F., Cooksley and Co., Cooper Bros., Copp, Ralph E., Cranley, J. P., Ltd., Cripps, William, Dairy Products Co-operative Co., Ltd., Dalgety and Co., Ltd., Davies, W. C., and Co., Dean, Henry, and Sons, Ltd., Edward, George, Eriksen, Hans P., Evans, Arthur L., Evans, Norman, Foggitt, Jones, Pty., Ltd., Fong Pie and Co., Francis, Frederick W., Gall, George, Granite Belt and Coastal Fruit Agency, Geeves, Hedley, Ltd., Gesler, Frederick C., Good, D. E., Pty., Ltd., Hall and Pascoe, Harris, H. N., and Co., Hodges and Pratt, Hutton, J. C., Pty., Ltd., Izatt and Johnson, Jacklyn and Justins, Jackson, J., and Co. (Produce and Seeds), Ltd., Johnson, and Markwell, W., Johntson, Adam, Johnston, Reginald W., Johnston and McDowall, Jordan, Ernest Arthur, Laidlaw and Co., Lambert, G. and W., Leavy, James H., Livingstone, J. R., Mackay, William M., Mant, Charles O., Martin, Duncan G., Martin and Co., Matthews, John, Mendoza and Wright, Murray, John, Murray Bros., McCausland, Louis J., McCowan and Hammond, New Zealand Loan and Mercantile Agency Co., Ltd., Nicholson, Alphonso, Pettigrew and Wilson, Queensland Fruit Distributors, Robinson and Laidlaw, Robsons Ltd., Rollinson, John Edward Linsey, Russell, M. M., and Co., Ltd., Sellars, R. B., Sellars, Derek P., Shay,

Percy, Sibley, P. C., Siemon, W., and Sons, Ltd., Skinner, P. J., Stanton Bros., State Produce Agency Ltd., Stewart and Walker, Sutton Bros., Tacey and Eyre, Thorpe, H. W., Wanless, Thomas H., Watson, W. P., and Co., Whatling, E. H. R., Wiltshire, F. C. G., Winters, Edward, Wool, A. E., Wool, H. L., Yow Sang and Co.

*Other Agents.*—Backhouse, J. J. C., Killarney; Baker, G. H., Stanthorpe; Black, H. L., Mackay; Bramble, J. G., Rockhampton; Brand, Thomas, Mackay; Curtis, W E,, and Co., Bundaberg; Dawson, Joseph, Rockhampton; Dick, Charlie, Rockhampton; Ellwood, E. A., Killarney; Featherstonhaugh, Albany, Roma; Fowles, Herbert, Roma; Gore, A. C., Cambooya; Goltz, F. W., Mackay; Good, D. E., Rockhampton; Gore, Edward, and Co., Oakey; Gower, H. R., Rockhampton; Haigh, E. V., Ipswich; Harding and Walker, Ipswich; Healy, M. F., Rockhampton; Heers, J. W., Coominya; Joyner, R. G., Gladstone; Lee Sang and Co., Cairns; Leonard, T. J., Mackay; Limpus, Bert, Bundaberg; Limpus, C. M., and Co., Bundaberg; Lindemann, C. H. D., Lowood; Lymburner, E. A., Cairns; Mackay District Co-operative Fruit, Vegetable, Poultry, and Bacon Association, Ltd., Mackay; Manz, Walter, Lowood; Mar Kong, Townsville; Marles, W., and Sons, Bundaberg; Maxwell, Samuel, Warwick; Moynehan, W. H., Imbil; MacDiarmid, A. M., Crow's Nest; Olsen, A. E., Killarney; Poll and Co., Wynnum South; Profke, Albert, Lowood; Ransome, V. W., Warwick; Redmonds Pty., Ltd., Bundaberg; Reeds Ltd., Maryborough; Rex, J. W., Maryborough; Reye, C. A. H., Townsville; Stay, W. H., Toowoomba; Sun Wo Tey, Cairns; Tatnell, W. R., Gympie; Thomas, D. B., Gympie; Thomas, George, Gympie; Thomas, L. J., Gympie; Thompson, Sydney, Warwick; Thorpe, T. E., Cairns and Townsville; Tong Sing, Cairns; Townsville Fruit Exchange, Townsville; Tung Yep, Cairns; Viles, K. L., Kandanga; Wakeford, W. J., Townsville; Walker, E. E., Gympie; Walker, Shaw, Townsville; Walters, W. J., Lowood; Warneke, A. E., Gladstone; Warrys, Ltd., Maryborough; Waters and Punzell, Mackay; Wilkinson, J. J., Nambour; Williams Ltd., Rockhampton; Wilson, John, Kingaroy; Willie Young, Rockhampton.

## QUEENSLAND SHOW DATES, 1933.

Bowen: 5th and 6th July.
Gatton: 5th and 6th July.
Woodford: 6th and 7th July.
Ayr: 7th and 8th July.
Cleveland: 7th and 8th July.
Townsville: 11th and 12th July.
Caboolture: 13th and 14th July.
Rosewood: 14th and 15th July.
Nambour: 19th and 20th July.
Charters Towers: 19th and 20th July.
Esk: 21st and 22nd July.
Ingham: 21st and 22nd July.
Atherton: 25th and 26th July.
Cairns, 18th to 20th July.
Maleny: 26th and 27th July.
Pine River: 29th July.
Royal National: 7th to 12th August.
Crow's Nest: 23rd and 24th August.
Home Hill: 1st and 2nd September.
Imbil: 1st and 2nd September.
Enoggera: 2nd September.
Malanda, 6th and 7th September.
Innisfail: 8th and 9th September.
Mary Valley: 1st and 2nd September.
Kenilworth: 30th September.
Southport: 6th October.
Nerang: 13th October.

NOTE.—The Esk Show set down for 21st and 22nd July has been abandoned.

Plate 13.—On the Brassall–Haigslea Road, West Moreton District.

Plate 14.—Jetting Concrete Piles.
Pump used by Main Roads Commission on the Main South Coast Highway.

# Answers to Correspondents.

## BOTANY.

*Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril, White, F.L.S.*

### Khaki Weed.

C.K.R. (Wynnum)—

The specimen is the Khaki Weed or Khaki Burr, *Alternanthera achyrantha*, a native of tropical America, now a naturalised weed in many parts of the world. It is one of the worst weed pests we have in Queensland, and should be eradicated as soon as possible whenever it makes its appearance in a new locality.

### Groundsel Bush.

N.S. (Cooroy)—

The specimen is *Baccharis halimifolia*, the Groundsel Bush, a native of South America, now a very common naturalised weed in Queensland. It has been suspected of poisoning stock, and as members of the genus were known to be definitely poisonous, feeding experiments were carried out some years ago at the Animal Health Research Station, Yeerongpilly. These gave negative results. At the end of the feeding period, however—about a fortnight—the animals were very emaciated and in poor condition, but they recovered when put on to better feed. From this it is inferred that the plant has no value as a fodder, and unless better feed was available stock would certainly die from starvation.

### Cattle Bush, Homalocalyx Polyandrus.

G.S. (Dalby)—

The tree with the yellow fruit is *Pittosporum phyllyræoides*, commonly known as Cattle Bush, a small tree widely spread through Western Queensland, New South Wales, and parts of South Australia. It is generally regarded as excellent fodder for stock. The little health-like shrub from the rocky country proved to be *Homalocalyx polyandrus*, a most interesting find. It is a small Myrtle, only previously known from very scrappy material collected by the explorer Leichhardt, somewhere in Queensland or in the Northern Territory. So, later on, if you could let us have a good bundle of flowering material, the favour would be greatly appreciated.

### Weir Vine.

INQUIRER (Glenearn)—

The specimen forwarded is *Ipomae calobra*, the Weir Vine, a native of Western Queensland, generally regarded as poisonous to stock. When sheep eat the vine they develop symptoms similar to those of animals affected by Indigo or Darling Pea. Cattle and horses are also affected. A poisonous principle, however, has not been isolated from the plant. The plant forms a large underground tuber, which, unlike the green part, is quite edible and was an important article of diet with the aborigines in the early days.

### Licorice.

INQUIRER (Toowoomba)—

So far as we know the Licorice plant is not now grown in Queensland. Some years ago it was grown to a very limited extent on the Darling Downs and in the Granite Belt. It is, we understand, still grown to a limited extent in the Southern States.

### Mangroves.

F.W.S. (Maryborough)—

1. *Aegiceras majus* (River Mangrove).—Not known to be poisonous or harmful in any way, though I do not know that it is eaten by stock.
2. *Excæcaria agallocha* (Milky Mangrove).—Poisonous, but I do not think it is eaten by stock. No antidote is known, but if you have had any trouble with this plant write to the Director, Animal Health Station, Yeerongpilly.
3. *Avicennia officinalis* (White Mangrove).—Freely eaten by stock and generally regarded as an excellent fodder. It is not known to possess any poisonous properties, but stock sometimes get sick through searching for the fallen beans in the mud and swallowing a certain amount of mud along with the beans, of which they are very fond.
4. *Rhizophora mucronata* (Red Mangrove).—Not known to be poisonous, but rarely eaten by stock.

### Starr Burr.

J.B.C. (Oakey)—

The specimen is the Starr Burr, *Acanthospermum hispidum*, a native of tropical America, now a naturalised weed in most tropical countries. It has been established in Queensland for a number of years, and about Townsville and in parts of the Gulf country it is one of the worst weed pests. Of recent years it has spread south, and is now moderately common about Brisbane. This, however, is the first record we have had of the plant's occurrence on the Downs.

### Rattle-Pod or Rattle-Box.

T.A.P. (Toowoomba)—

The specimen is *Crotalaria incana*, a species of Rattle-Pod or Rattle-Box, a common weed in some parts of Queensland. It has been accused of poisoning stock on various occasions, though we have no very definite information on this point. In view of the fact, however, that several species of the genus *Crotalaria*, both in Australia and abroad, have been definitely proved by feeding tests to be poisonous to stock, the plant must be regarded with suspicion and its eradication advised. The plant is sometimes known as wild lucerne owing to its resemblance to ordinary lucerne, but this vernacular is not to be encouraged, as several other plants are known in Queensland as wild lucerne which are quite good fodders.

### Northern Grasses and Other Specimens Identified.

J.Mc. (Hughenden)—

No. 44, *Chionachne barbate.*—A native grass, closely allied botanically to maize and Tiosinte. On account of the amount of grain it carries it should be a highly nutritious and valuable fodder grass. We do not know that it is common in any particular locality, and have heard no local name for it.

No. 45, *Commelina cyanea.*—This plant is sometimes called "Wandering Jew," a name, however, applied to a number of plants of the same family. It is sometimes called Scurvy Grass, and is reputed to be used as "greens." It is not known to possess any poisonous or harmful properties.

No. 46, *Corchorus hygrophilus.*—A native plant moderately common in the Northern Territory and the north-west of Queensland. We have not heard any local name for it, but it belongs to the wholesome family of plants, the Tiliaceæ, and is not known to possess any harmful or poisonous properties.

Nos. 46A, 47, and 48 all represent different growth stages of the common *Salsola Kali*, Roly Poly, or Russian Thistle. We should think the plant would be quite useful as roughage for sheep. It is probably at its best when in young seed, as the stock are very fond of the seed-bearing tops which are naturally fairly nutritious. On the whole, the plant is an inferior fodder.

No. 49, *Amarantus Mitchellii*, Boggabri.—In its slightly younger stages this plant is quite a good fodder and, even in the old, dried stage forwarded may have some value on account of the quantity of seed produced.

No. 50, *Flaveiria australasica.*—A very common weed in Central and Northern Queensland. The only local name we have heard applied to it is Yellow Weed, a name, however, given to other plants in Queensland. It has been reputed poisonous to stock, but we have no definite information. We rather doubt its fodder value.

Nos. 51 and 52, *Triodia* sp.—Unfortunately all the seeds had fallen out of the specimen forwarded. We think the only value of the Spinifex Grass as fodder lies in the seeds. These are readily eaten by all classes of stock, especially horses.

No. 50A, *Sorghum* sp.—Is this a native grass? If so, we would much appreciate complete material, especially a piece of the lower part of the stem showing the root system. It seems to us more like one of the cultivated sorghums, but which one, from the small specimens, it is impossible to say.

The specimen submitted by T. Field, Hughenden, is *Justicia procumbens*, a small plant of the family Acanthaceæ. It is very common in parts of Queensland, but we have never heard a local name given to it. We have had no personal experience with it but, judging from some of its allies, we should say the plant would make quite a good fodder.

**A Valuable Fodder (*Echinochloa Turneriana*)**

J.H.McC. (Hughenden)—

The specimen is a native of Central and Western Queensland and, we should say, an extremely valuable fodder. The genus *Echinochloa* is a small one, and contains such well-known cultivated fodders as Japanese Millet and White Panicum.

**Tape Vine or Ivy Weed.**

R.J.C.J. (Mudgeeraba)—

The specimen is *Stephania hernandiæfolia*, commonly known as Tape Vine or Ivy Weed. This plant is definitely poisonous and, we think, is the probable cause of your trouble. Wild passion vine is poisonous, but generally stock have to eat large quantities of it to show any ill effects. We have never heard of any plants of the Currajong family being poisonous or harmful to stock in any way.

**Guinea Grass, Giant Couch.**

T.B. (Howard)—

The tall-growing grass is Guinea Grass, *Panicum maximum*, a grass with a varying reputation as a fodder. It is suitable for either hay or grazing. The grass with a creeping habit is *Brachiaria mutica*, better known in Queensland as Giant Couch or *Panicum muticum*. It is very palatable grass to stock, and is one of the best grasses in coastal Queensland. It prefers rather damp situations. In some parts of North Queensland, such as the Daintree River and the wetter parts of the Atherton Tableland, it is the most important dairying grass.

**Suitable Trees for Chinchilla District.**

H.C. (Chinchilla)—

The following trees should do well in your district:—

Insignis Pine (*Pinus radiata*).—This pine is much cultivated in the Southern States and on the Darling Downs. If seed is not available in Toowoomba it should be obtainable from any recognised Southern nurseryman. It is not grown to any extent in Brisbane.

Torulosa Pine (*Cupressus torulosa*).—This is a large cypress, much grown as a breakwind and shade tree. As regards a supply of seed, the same remarks apply as to the Insignis Pine.

Pepperina Tree or Pepper Tree (*Schinus molle*).—Much grown in Western New South Wales and Western Queensland. Seeds or plants should be obtainable from any recognised nurserymen.

Bottle Tree (*Sterculia rupestris*).—This tree might be obtainable in your own district, and if so, you should find seedlings or young trees transplant quite readily. The Forestry Department has on hand at the present time a large quantity of seed, and if you ask some may be sent to you for trial purposes.

Currajong.—Like the Bottle Tree, you might be able to get young plants of this locally. If not, most nurserymen stock plants; or if you preferred seeds you could get them from A. Murphy, Seedsman, Woy Woy, New South Wales.

Sugar Gum.—This is not grown to any great extent in Queensland, but the plants are stocked by most Southern nurserymen, or if you want seeds you could obtain them from Mr. Murphy, of Woy Woy.

Honey Locust and Carob Bean are two leguminous trees with edible pods. Planted to some extent on the Downs, and plants or seeds should be obtainable from Toowoomba or Southern nurserymen. Mr. Leadbetter, Curator of the Botanic Gardens, Toowoomba, may be able to supply you with seeds from some of the trees in the gardens there.

We do not understand your lack of success with Camphor Laurels, as we find here that these seeds germinate readily, the usual practice being to sow them in flats or boxes, prick them out into pots when a few inches high, and then transplant them into their permanent situations.

We think the planting of shade trees in Western Queensland an exceedingly important matter, and the desirability of propagating a number of the trees mentioned and some others for distribution to farmers and pastoralists at a nominal rate is being considered.

**Suitable Shade Trees for the North-West.**

G.W. (Maxwelton)—

A number of trees that should do well if planted in your district. Following is a selection:—

Bottle Tree, both narrow-leafed and broad-leafed varieties. The Forestry Department happens to have at the present time a large quantity of seed of the narrow-leafed Bottle tree, and no doubt you could obtain some for trial purposes.

*Albizzia Lebbek.*—This is the tree much planted in Western Queensland and commonly known as Acacia. You could easily get seeds in your own district or from Hughenden, and raise plants for planting out.

Pepper Tree or Pepperina (*Schinus molle*), much planted in parts of Western Queensland and Western New South Wales. Plants should be available through most nurserymen.

*Celtis sinensis.*—Though a native of China this tree is commonly called Portugese Elm in Queensland. It should do well with you and the leaves are valuable stock food. Seed will be available from the Botanic Gardens, Brisbane, next February or March.

Citron Gum (*Eucalyptus citriodora*), a very quick growing Eucalypt. It does well in a variety of situations and is well worth planting. It should be obtainable from any recognised nurseryman.

*Phytolacca dioica, Phytolacca* or *Bella sombra* tree.—This tree is worthy of extensive planting. It is exceedingly quick growing, but is subject to frost. The leaves make excellent fodder for stock. Seed is obtainable from Mr. R. Dick; Purga, via Ipswich, at the price of 2s. per large packet.

Parkinsonia Tree (*Parkinsonia aculeata*), very widely planted in Western Queensland, and you should be able to obtain seeds locally. There is a chance that it might run out and become a pest, but we think probably its virtues would outweigh any doubtful qualities.

Algaroba Bean (*Prosopis juliflora*).—This is being planted now to some extent in parts of Western Queensland, and if not obtainable locally you might get seeds from Longreach or Winton. Failing that, write to the Curator of the Botanic Gardens, Brisbane. Like the Parkinsonia Tree it has been suggested that this tree might run out and become more or less of a pest, but we think here again its virtues far outweigh any bad qualities the tree might possess. It certainly is a valuable forage.

The planting of shade trees in North-Western Queensland is an exceedingly important matter, and one having an important bearing not only on lamb-raising but on stock breeding generally.

**Suitable Grasses for the Blackall Range.**

J.H. (Mapleton)—

An excellent grass for the conditions you mention would be Kikuyu. This is obtainable from most nurserymen and agricultural seedsmen. It is propagated from cuttings, as seed is quite rare. The grass, however, is a rapid grower and easily propagated by vegetative means. Another grass you might try is *Panicum muticum*, or Giant Couch. This is similar in growth to Kikuyu, but of more robust habit. If you have difficulty in obtaining supplies locally you could obtain a bag of cuttings from the Botanic Gardens, Rockhampton, but we do not know what charge is made. Like Kikuyu, propagation is by cuttings, not by seed.

Regarding leguminous plants, we should say that the ordinary White Clover would be best. Red Clover is also worthy of trial; we have had one or two reports of its doing quite well on the North Coast Line, but have not personally seen it. Of Cocksfoot and New Zealand Rye we have not had personal experience, but the latter should be worthy of trial. *Phalaris tuberosa* would probably do well during the winter months, but it may die out in the summer. We think it is more suited to the Darling Downs and New England districts than to the Blackall Range. The common Guinea Grass which is everywhere a weed in orchards on the Blackall Range is a uesful fodder if kept cut or eaten down, but soon becomes rather rank and unpalatable.

# General Notes.

## Staff Changes and Appointments.

Mr. George Burton, Cambooya, has been appointed Chairman of the newly elected Canary Seed Board until the 31st May, 1934.

The resignation of Mr. T. Toms, Maryvale, as Acting Inspector of Stock has been accepted as from 30th April.

Constable P. H. Gimpel, Eromanga, and Constables N. E. Bahr and P. J. Rynne, both of Ingham, have been appointed Inspectors of Slaughter-houses.

Constable A. V. Tanner, Mount Molloy, has been appointed an Inspector of Brands.

Mr. F. C. Hunter, Court House, Maryborough, has been appointed an Honorary Ranger under and for the purposes of the Animals and Birds Acts.

Mr. D. O. Atherton, Assistant to Entomologist, at present stationed at Atherton, has been appointed Assistant Entomologist as from the 1st April, 1933.

Messrs. E. H. Crease and J. Murnane, of Upper Tallebudgera, via West Burleigh, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Constable E. D. Bauer, Maryborough, has been appointed also an Inspector of Brands.

Messrs. R. B. Corbett (Woombye), A. A. Cousner (The Gap, Ashgrove), Tom Hallick (Mount Gravatt), A. McLauchlan (Boonah), W. T. Hughes (Toowoomba), and E. Graham (Director of Marketing, Brisbane), have been appointed members of the Egg Board for the period from the 1st May, 1933, to the 31st December, 1933.

Mr. W. J. Sheahan, Inspector of Stock, Clermont, has been appointed also an Inspector under and for the purposes of the Slaughtering and the Brands Acts.

Mr. N. C. Copeman, Inspector of Stock, Wandoan, has been appointed also an Inspector under the Slaughtering Act.

Constables H. E. Benson, Jundah, and J. W. Elstob, Bollon, have been appointed also Inspectors under the Brands Acts.

Mr. T. E. Dwyer, Acting Police Magistrate, Mackay, has been appointed Chairman of the Farleigh, Plane Creek, Pleystowe, and Marian Loal Sugar Cane Prices Boards, in the place of Mr. M. Gallagher, who has resigned the Chairmanship of these Boards.

Mr. A. C. McLaughlin, Buckleton, Springsure, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. B. Flewell-Smith (Committee of Direction of Fruit Marketing), K. L. Viles and J. R. Stocks (C.O.D., Kandanga and Nikenbah, respectively), and Mr. Thomas Shiels (Upper Tallebudgera) have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. A. E. Watt, Coolangatta, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

The resignation of Mr. H. W. Harvey as Acting Stock Inspector at Banana has been accepted, as tendered, and Mr. John King, of Banana, has been appointed Acting Stock Inspector in place of Mr. Harvey.

Mr. T. F. Corbett has been appointed Cane Tester for the forthcoming sugar season at the Inkerman Mill.

## Banana Industry.

Two new Regulations have been issued under the Banana Industry Protection Act. These provide that any authorised officer of the Banana Industry Protection Board may enter the premises and inspect the books and accounts of any grower, authorised agent, carrier, or other person for the purpose of obtaining information as to the quantity of bananas produced in Queensland and marketed by any grower, and may make copies or take extracts therefrom. Any person who obstructs or impedes an officer in the execution of any of these powers will be guilty of an offence and liable to a penalty of £5 for a first offence and not exceeding £20 nor less than £5 for a second or subsequent offence.

## Dairy Produce Act Examinations—A Reminder.

The date for the holding of the annual examinations in the theory of milk and cream testing, milk grading, cream grading, butter making, and cheese making is 29th July next. Applications must be lodged with the Department before the 12th July.

### Honey Board.

The result of the recent election of four growers' representatives on the Honey Board was:—Charles William Edwards (Greenbank, via Kingston), 248; Owen Norman Tanner (Samford), 156; Henry Edgar Fagg (South Killarney), 156; John Schutt (Perthton), 144; Alex. Roy Brown (Park Ridge), 142; Roy John Bestmann (Caboolture), 132; and George Herbert Whiting (Coowonga, via Rockhampton), 122. The successful candidates will be appointed for a term of one year as from the 16th April, 1933.

### Queensland Apples in London.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) is in receipt of information from the Acting Agent-General for Queensland in London (Mr. L. H. Pike), to the effect that he had personally examined or obtained reports on various shipments of Queensland apples recently despatched overseas. In every case the quality, condition, and grading were satisfactory, but it was noted that a proportion of the fruit was affected by bitter pit. It was suggested that certain improvements in packing would be an advantage, and in this connection the practice of lining cases with corrugated paper, as adopted by New Zealand, was advocated.

### Atherton Tableland Maize Board.

In July, 1932, an Order in Council was issued extending the operations of the Atherton Tableland Maize Board for a period of ten years from 1st July, 1933, to 30th June, 1943.

Executive approval has been given to the issue of a further Order in Council under the Primary Producers' Organisation and Marketing Acts extending, for the abovementioned period of ten years, the powers of the Board in respect to borrowing money on mortgage.

### Trans-Boarder Stock Restrictions at Killarney.

An Order in Council was issued recently restricting the introduction of stock through the crossing place at Killarney on account of an outbreak of cattle tick in the portion of New South Wales adjacent to this crossing. Approval has now been given to a further Order in Council which prohibits the introduction into this State of any stock from New South Wales through the crossing place at Lower Acacia Creek. This crossing is in close proximity to the Killarney Crossing.

### Animals and Birds Sanctuary at Springsure.

Grazing Homestead 2481, which comprises part of Nalcoombie Holding, in the Springsure District, has been declared a sanctuary under the Animals and Birds Acts by an Order in Council. It will now be unlawful for any person to take or kill any animal or bird on this property.

### Dairy Science Schools.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) in discussing the activities of his Department in its educational extension work, has announced that short schools of dairy science, each of one week's duration, will be conducted at Malanda and Kingaroy for the benefit of factory managers, employees, and interested dairymen. A similar school has just closed at Toowoomba.

The success of last year's schools led to the more ambitious programme this year. A range of subjects even more comprehensive than that of last year's programme has been arranged for the present series by Departmental officers. The more the fundamentals of dairy science are promulgated throughout the dairying centres and brought particularly before those men who handle our butter and cheese, said Mr. Bulcock, the better will they be able to grapple with the problems of manufacture that confront them in their every day work.

The dates for the schools are—Malanda, 10th to 14th July; Kingaroy, 21st to 25th August.

In addition to these schools, arrangements are also being made for refresher courses at an early date for Departmental field officers in veterinary and dairying science at the Animal Health Station, Yeerongpilly.

A start will also be made in the first week in August in short courses of instruction to leaders of dairying committees which have been formed throughout the State in furtherance of the policy of bringing the dairy farmer into closer co-operation with the activities of the Department of Agriculture and Stock.

### Sugar Cane Levies.

The Minister for Agriculture (Mr. F. W. Bulcock) has approved of the levying of an assessment at the rate of one halfpenny (½d.) per ton on all sugar-cane produced during the season 1933-1934 for the purposes of the Sugar Experiment Stations Acts. This assessment is at the same rate as that for the past season 1932-1933.

An Order in Council has been issued fixing the assessment for the purposes of the Sugar Cane Prices Acts for the coming season 1933-1934 at one penny farthing (1¼d.) per ton on all sugar-cane produced in Queensland. This assessment also is at the same rate as that levied under the Regulation of Sugar Cane Prices Acts during the season 1932-1933.

### Tick Precautions at Killarney Border Crossing.

An outbreak of cattle tick has been reported from that portion of New South Wales adjacent to the Queensland border at Killarney, and precautions are being taken by the Department of Agriculture and Stock to ensure that the outbreak does not spread into Queensland by means of stock movements through the crossing-place at Killarney.

An Order in Council has therefore been issued further restricting the introduction of cattle at that place. From now on all cattle and horses entering Queensland at Killarney must be provided with a certificate of health and freedom from ticks, and also a certificate that the cattle have been dipped and the horses either dipped or hand-dressed within the seven days immediately preceding their introduction. They must be found clean from ticks upon inspection at the crossing-place, and must be again dipped or hand-dressed at Killarney before they are finally allowed to proceed.

### Mill Suppliers' Committees.

A regulation has been issued amending certain regulations under the Primary Producers' Organisation and Marketing Acts with reference to mill suppliers' committees. When a vacancy occurs in the personnel of a district canegrowers' executive it could hitherto be filled either by the mill suppliers' committee concerned or the remainder of the district executive. In accordance with the amendment, any vacancy will now be filled by the mill suppliers' committee concerned only. Regulation 354 has also been amended to provide that the representative of any mill on the district executive who is *ex officio* a member of the mill suppliers' committee shall be eligible for election to the position of chairman of the committee.

### Plain Turkey Protected—Its Importance in Farm Economy.

An Order in Council has been issued under the Animals and Birds Acts totally protecting the bustard or plain turkey in the Shires of Woothakata and Tinaroo, North Queensland. A previous Order in Council was issued affording total protection in the Shire of Eacham. This action has been taken as a result of representations made by sugar-farmers and others that the plain turkey is an important factor in keeping down inspect pests in the fields. Enquiries made by the Department of Agriculture have confirmed this, and the shire councils concerned have also supported the action taken. Prior to the issue of these Orders in Council, only partial protection was afforded the palin turkey.

### Pig School at Gatton.

Arrangements have now been completed for holding the Annual School of Instruction for those interested in the breeding, feeding, and marketing of pigs. The school is to be held at Gatton College commencing on **Monday, 14th August, and concluding on Saturday, 26th August.** Applications are now being received and those who are able to arrange attendance should lose no time in lodging their applications with the Principal, Queensland Agricultural High School and College, College Siding, Queensland.

Concession fares by rail are available throughout Queensland, and the school fees (approximately £3 10s.) include all charges for board, residence, instruction, and excursion to bacon factory.

The Principal (Professor J. K. Murray) is anxious to have all applications as early as convenient in order to arrange accommodation, hence those interested will materially assist by prompt action in order to save disappointment.

Further particulars may be obtained from the Principal at the College, or from the Department of Agriculture and Stock, Brisbane, Queensland.

**Buffalo Fly Infested Area.**

An Order in Council has been issued under the Diseases in Stock Acts altering the boundaries of the Infested Area declared in North-west Queensland in March, 1929, for the purpose of the control of the buffalo fly. The area has been extended to include all know infested and adjoining holdings incorporated in the areas defined during the last cattle season.

**Cheese Board.**

An Order in Council has been issued under the Primary Producers' Organization and Marketing Acts, giving notice of the intention of the Governor in Council to extend the operations of the Cheese Board for the period from the 1st August, 1933, to the 31st July, 1934. It is also declared that the Governor in Council will receive, on or before the 3rd July, 1933, a petition signed by not less than 10 per cent. of the growers of cheese, requesting that a vote of such growers be taken on the question as to whether the functions of the Cheese Board shall cease on the 31st July, 1933, or continue until the 31st July, 1934. Growers eligible to vote will be cheese manufacturers and persons who, at any time within the six months immediately prior to the election supplied or supply milk to cheese factories in Queensland.

Nominations are also being called for the election of five growers' representatives on the Cheese Board for a term of one year from 1st August, 1933.

**The International Year Book of Agricultural Statistics.**

The International Institute of Agriculture at Rome has recently published the 1931-32 edition of the ''International Year Book of Agricultural Statistics.''

This volume—of about 800 pages—is the result of the most extensive and detailed inquiry made in the domain of international agricultural statistics, and constitutes a work of the greatest importance to all those who are interested in questions having a direct or indirect relation to production and commerce of agricultural products.

In the first part of the year book are classified the figures for area and population in the years nearest to 1927 and 1931 for 208 countries; the presentation of these figures throws light upon the world situation from the geographical, political, and demographical points of view during the post-war period. The second part is composed of a series of tables comprising for nearly fifty countries the available data concerning the uses for which the total area is employed, the apportionment of cultivated areas between the different crops, agricultural production, numbers of the different kinds of live stock and the products derived from them. In the tables constituting the third part of the volume, have been indicated for nearly forty agricultural products, the area, production, and yield per acre in each country during the five years 1923-1927, and during each of the years from 1928 to 1931.

For each kind of live stock all available figures in the different countries have been grouped for the years 1927 to 1931. A large part of the volume is devoted to statistics of the commercial movement of forty-three vegetable products and thirteen products of animal origin. The figures published relate to the imports and exports during the calendar years and for the cereals also during the commercial seasons.

It may be added that the tables of production and commerce not only specify details for each country but also the totals for the different continents and hemispheres and for the whole world, allowing the formation of a general idea of the changes taking place during the periods under consideration in the area under each crop, quantities harvested, and the commercial movement in each product.

The part devoted to prices contains the weekly quotations of twenty-five agricultural products on the principal world markets for the period January, 1927, to July, 1932. In the freights section will be found the quotations for the transport of wheat, maize, and rice on the most important shipping routes, and in the section reserved for fertilizers and chemical products useful in agriculture are published statistics of production, trade, consumption, and prices for fifteen products. In the Appendix have been brought together special chapters on the distribution of agricultural holdings according to their size and mode of tenure. The forestry statistics have been extended and developed, and will be published in a separate volume under the title of ''International Year Book of Forestry Statistics.''

**Sanctuary at Willowburn.**

An Order in Council has been issued under the Animals and Birds Acts declaring the grounds of the Willowburn Mental Hospital, Toowoomba, to be a sanctuary under the abovementioned Acts. It will now be unlawful for any person to take or kill any animal or bird on this property.

# Rural Topics.

## Feeding a Famous Jersey.

There is a well-founded saying to the effect that it is not possible to get from a cow more than you are prepared to put into her in the form of feed. Thus, whenever a new record is established, the dairy farmer immediately becomes interested in how the record producer was fed.

Many have asked that question since 1st February, on which date the thirteen-year-old Jersey cow, "Wagga Gladys," completed her 273 days' lactation period with a world's record butter-fat production for her breed of 935.23 lb. (from 17,202 lb. milk), states the New South Wales "Agricultural Gazette." "Wagga Gladys" is a member of the Hawkesbury Agricultural College Jersey herd, and this is the second occasion on which she has established a world's record. Chief interest now centres in whether she can better the 365 days' record of 1,220 lb. butter-fat held by the New Zealand Jersey cow, "Woodlands Felicie."

Although varying slightly from month to month during the lactation period, throughout the greater part of the time she was fed on the following ration:—Silage 20 lb., lucerne chaff 10 lb., and 3 lb. of a mixture of bran 100 lb., linseed meal 50 lb., and bone-meal 3 lb. In addition, for every gallon of milk produced, her daily ration was augmented by 2 lb. of a mixture comprising bran 100 lb., maize-meal 80 lb., crushed oats 30 lb,. and linseed 20 lb. The grazing varied considerably. During the winter months there was a fair picking of green barley and green wheat, and at other times she was given an occasional day's grazing on short lucerne.

No very special treatment was meted out to "Wagga Gladys." She remained with the college herd except during the days when they had to travel more than half a mile to the grazing paddock. She was milked twice a day throughout the test.

## The Future of Rural Industry.

The Secretary for Agriculture in the United States of America, in addressing a large body of pig producers recently, had this to say in regard to future prospects in rural industry:—

"In times like the present the pig producer, like all of us, is apt to forget normal relationships. He may feel that he is caught in a web of economic difficulties. He may forget temporarily his own production skill, mastery over disease, the normal value of swine as profit-makers.

"There is no reason for losing faith in the future of the pig industry, for in the long run, when the general fear is broken and credit once more flows normally through all the channels of trade, the efficient producer is bound to reap the bounty of his labour. Realising that the pig did not gain its reputation as a mortgage-lifter on the farm of the inefficient farmer, producers should apply more strictly than ever before scientific and economic production methods. Above all, they should produce only that number of pigs that they can grow and sell on a profit-making basis.

"America will come back. America will be stronger than ever before. Every sound industry will rise to new heights, and the people of those industries will secure even greater rewards. I have no doubt of this." The Australian producer may accept the foregoing as applying somewhat to our own particular problems of the day.

## Tapping for Bloat.

Tapping for bloat is done, when necessary, by inserting a sterilised trocar (dagger) and canula (tube or sheath) in the distended paunch (rumen) high up in the left flank, close to the last rib and transverse spines of the backbone. Hair should first be clipped or shaved from a small patch of skin where the instruments are to be inserted; then the skin should be cleansed and disinfected, unless it is absolutely necessary at once to do the tapping to save the life of a gasping cow. The instruments should be directed inward, forward and downward, as if aiming for the right elbow of the cow. When inserted full length, draw out trocar, leaving the canula in place. When the gas has escaped, return the trocar to the canula and very slowly pull out both instruments; pinch the opening in the skin shut and then apply tincture of iodine, if available; otherwise apply pine tar. The instruments may be bought from a veterinary supply house.—"New Zealand Farmer."

### The Importance of Minerals.

It is imperative to realise that a stock lick is primarily intended to supply those minerals essential for growth and production which are lacking in the soil and, consequently, in the grasses, &c., growing thereon, from which the animals obtain their food supply. It is absolutely impossible for any animal on a diet poor in essential minerals to make normal growth or to be capable of normal production, whether it be flesh, wool, or milk.

The minerals commonly found to be deficient in pastures are phosphorus (in the form of phosphoric acid) and calcium (in the form of lime). These two minerals enter very largely in the composition of bones; hence young animals developing their skeletons require greater amounts of these minerals than adults. Similarly the pregnant female requires large amounts of these minerals in order to supply the needs of her own body, and also to build the skeleton of the growing fœtus. Calcium plays an important part in controlling the clotting of blood, in regulating the heart's action, determining the firmness of muscle, in assisting the digestion of fat, and controlling the action of other minerals on the body. Phosphorus is essential for the building up of all tissues of the body, and without it the supply of wool, milk, and flesh would be impossible. Deficiency of calcium and phosphorus results in stunted growth, poor carcasses, low production, and weak constitution.

### Supply Bone Meal and Salt Separately.

Owners are advised by the Department of Agriculture to adopt the practice of supplying pure bone meal to their stock. Salt, which is also essential, should also be supplied, but in a separate container to the bone meal. The animals themselves will then be able to choose the amount of either they will consume—and the animal is a better judge as to what it requires than is man. Stock which have been accustomed to being fed a lick containing salt may, for a few days, require to be enticed to partake of the pure bone meal, and this can be accomplished by mixing a small amount of salt with a small amount of bone meal.

There is special need for stockowners to make a careful and impartial survey of this lick question. No owner can afford to pay high prices for licks with a low phosphate content. There can be no doubt that the provision of bone meal and salt is the most economical and most satisfactory method of rectifying any mineral deficiency which might exist in the feed of the animals.—A. and P. Notes, N.S.W. Dept. Agric.

### Dodder—The Greatest Enemy of Lucerne.

Dodder is a parasitic plant, with long leafless stems, orange yellow in colour. The dodder seed germinates in the ground, and the young plants attach themselves to the lucerne seedlings. As soon as the thread-like vine is firmly attached to the lucerne plant, the stem connecting it with the ground withers away, and the dodder draws its sustenance from the lucerne by means of tiny suckers, which enter the tissues of the host plant. The dodder flowers are a beautiful golden colour. As the parasite develops, the tangled masses of crop in which it occurs have the appearance of ringworms, working from the centre outwards.

On no account should dodder be sown with the lucerne seed. Fortunately the removal of seeds of dodder is a simple process, as they are much smaller in size than lucerne seeds, and can be removed by screening through a mesh sufficiently close to retain healthy lucerne seed, whilst allowing the dodder to pass through.

If dodder appears in a lucerne paddock it should never be allowed to seed, but the affected growth should be removed as soon as possible. The plants should be cut with a scythe or chipped to the crowns. The patches should be treated before the general crop is cut, as otherwise the parasite may be distributed throughout the field by the machinery. The infested material should be removed from the field, taking care not to drop any of the dodder during the process, and destroyed by burning.

### A Prolific Sow.

A Berkshire sow that produced fifty-four pigs and reared them in four litters, not losing one, ought surely be regarded as a champion. In one litter of twelve every pig was a female. There were fourteen in the next, but a few boars found their way into this family to break the spell. The sow is owned by Mr. P. O'Brien of Highfields, Queensland, and is a first-class specimen of the breed. She is still breeding freely and is like an old milking cow.

### Phosphorus and Calcium contained in Bone Meal.

Probably the best method of supplying this deficiency in phosphorus and calcium is by top-dressing the pastures with fertilizer, but next in importance to top-dressing is the supply of an adequate mineral lick; that is to say, a lick containing large amounts of these two minerals. The best form in which to supply phosphorus and calcium is as sterilised bone meal, which is a form of calcium phosphate. This is the product of ground-up sterilised bones obtained from animals slaughtered for human consumption, and it naturally contains all the minerals present in the animal's skeleton. Nauru or Ocean Island phosphate is another substance supplying these minerals, but the phosphorus is in a more insoluble form than is the case in bone meal, and is, therefore, not as readily available to the stock.

The addition of iodine to a lick is in the majority of cases unnecessary, and, furthermore, increases the cost of the lick enormously. Unfortunately, stockowners have indiscriminately used iodised licks in many cases where they were not indicated.

### Preparation of Land for Spring-sown Crops.

Where a preliminary ploughing has not been given to land which it is intended to sow in spring the operation should be attended to without delay. Whatever the crop, production will be more successful if it is grown on land which has been adequately prepared.

There are many advantages attached to early and thorough working of the soil; some of them are direct and others are indirect, but all are important in relation to the final result. The first direct advantage is the exposure of the soil for three or four months to the sweetening influences of sun, air, and frost, and the second the increased capacity of the soil for the absorption and retention of any rain that may fall.

The early ploughing should be deep, in order to ensure that when the seed is planted it will have a good depth of worked soil beneath it. Towards the end of the winter the land should be cultivated with the springtooth cultivator, and this should be repeated occasionally to conserve the moisture. If heavy rains have occurred during the period of cultivation it will be necessary to plough the land again, but in this case a shallow working will be sufficient. The effect is to open up and aerate the soil which has been hardened down by the rain, to give it a better physical condition, and to turn under any weeds that have grown. The aim in all operations should be to loosen the soil, as any rain which falls after the crop is planted will soon compact the seed-bed.

The result of this treatment is that the soil is in such good condition and has such a reserve of moisture when sowing time arrives that it is unnecessary to wait for rain to carry out sowing operations. This reserve has also an important influence on any fertilizer used. Soil moisture is essential for the best results from fertilizers.

Besides the above-mentioned benefits attaching to early ploughing and working of the soil, a large amount of plant-food is also released and made available for the needs of the crop. Analysis has shown that the bulk of our soils contain sufficient plant-food to produce crops for hundreds of years, but the trouble is that this plant-food is not in an available form, and on continuously cultivated soils it is only by a proper system of cultivation that a sufficiency of it is secured for the crop.—A. and P. Notes, N.S.W. Dept. Agric.

### Constipation in Pigs.

When pigs, particularly breeding sows close to farrowing, are severely constipated, and immediate bowel action is desirable, a powder consisting of 5 grains of calomel and one teaspoonful of sugar should be mixed, and made into a small ball with moistened pollard and given to the affected animals.

Rolling the ball of pollard in table salt before it is given to the pig will very often induce the animal to take it readily. The animal should be compelled to take plenty of exercise a few hours after it has taken the medicine. This treatment should be followed by a dose of 2 oz. Epsom salts in a small quantity of food or fresh milk.

It is essential in cases like this to be sure that the bowels are cleansed of accumulations of fæcal matter otherwise ill-health may continue, and the animal will have little or no desire for food. Feeding the animal on light, nutritious, appetising rations, in which there is a good supply of greens—lucerne, pumpkins, sweet potatoes—skim milk or similar foods is advised. Little grain is required, but plenty of clean drinking water should be allowed. On the third day after treatment add to the food one dessertspoonful of finely powdered Nauru phosphate and 10 grains of boracic acid to ''sweeten'' the stomach and put the animal in better heart. The drugs in powdered form should be mixed with a small quantity of meal and then be moistened to a paste before being added to the food. Continue this treatment for fourteen days in cases where the animal has been very ill.

### Egg Board.

The election of members for the two contested districts of the Egg Board resulted as follows:—

*District No. 2* (Brisbane North-Redcliffe).—Arthur A. Cousner, The Gap, Ashgrove, 94 votes; Henry E. Probert, Figtree Pocket, Indooroopilly, 50.

*District No. 5* (Darling Downs).—Walter T. Hughes, Toowoomba, 161 votes; Fred. M. Proellocks, Wyreema, 77.

The present members—Messrs. R. B. Corbett (Woombye), Tom Hallick (Mount Gravatt), and Alex. McLauchlan (Boonah), for Districts 1, 3, and 4 respectively—have been re-elected unopposed.

The new Board will hold office until the 31st December, 1933.

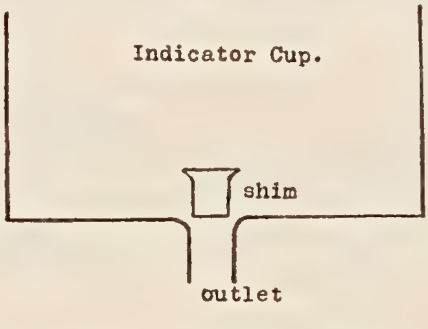
### Loss through Faulty Cream Separation.

Of the unledgered losses upon the dairy farm those due to faulty separation frequently receive little more than a passing thought until the matter is brought under notice by a separator salesman, who, as might be expected, is more interested in demonstrating a fault in the farmer's machine than in discovering the cause and rectifying it, observes an officer of the Dairy Branch of the Department of Agriculture in current notes. Not infrequently separators are regarded as worn out, or may even be faulty when first installed, as the result of too large an indicator cup outlet.

This is situated beneath the float, and upon the size or calibre of the outlet depends the speed at which the milk enters the bowl, the function of the float being to restrict the flow of the milk from the tap and thus prevent it overflowing. It will readily be seen that a worn or enlarged outlet will permit a greater quantity of milk to enter the bowl than that part of the machine was designed to deal with, with the result that imperfect separation takes place. Periodic spurting of milk from the cream spout has also been traced to this cause.

Excessive wear of the indicator cup outlet, which usually takes the form of a short tube, is most often the result of vigorous scouring with worn brushes, the wire of which, coming into contact with the metal, rapidly wears it away.

A rough test can easily be made should enlargement of the outlet be suspected to be the cause of butter-fat losses, failure of the cream screw to raise the test, or spurting of milk from the cream spout, by inserting thin flat shims in the neck of the outlet and observing the result. The shims may be made of thin capsule tin




similar to that used to seal certain types of tobacco tins and should be fashioned in the manner indicated in the diagram. One or more may be tried, and should the result justify the opinion that the outlet is too large, steps should be taken to permanently reduce the size.

Construction may be effected by placing a small bell-mouthed punch over the lower end of the tube and striking, or by getting a tinsmith to re-tin heavily the internal surface of the tube, which may then be reamed out to the desired size. Reaming should be done carefully, and a constant check kept upon the result by frequent tests under working conditions.—A. and P. Notes, N.S.W. Dept. Agric.

### Care of Stored Honey.

If honey is stored in a damp place, and not thoroughly sealed up, it will absorb moisture, and if excessive moisture is so taken up the honey is liable to ferment and deteriorate in value. Do not leave the lid off the containers, or leave honey exposed for any length of time during the later autumn and winter months. If kept in a dry place in a sound container honey will keep good for years; it may granulate, but that is not a sign of deterioration, and in such cases it may easily be liquefied by immersion of the container in hot water.

# The Home and the Garden.

## OUR BABIES.

(Issued by the Queensland Baby Clinics.)

*Under this heading we issue a monthly series of short articles dealing with the welfare and care of babies, in the hope of increasing their health and happiness, and decreasing the number of unnecessary deaths among them.*

## WINTER INFECTIONS.

THE glorious weather of our Queensland winter would be an unmixed blessing if this season were not cursed by diseases which attack the nose, throat, and air passages. They attack persons of all ages and do much harm, especially to those of weak health and early years. The most common is the ''cold'' or ''catarrh.'' Though often a mild disturbance of health, it may have serious consequences—bronchitis, pneumonia, and abscess of the ears—and these are sometimes fatal. Then there are the influenzas allied to the ''common cold,'' but more severe, and sometimes causing a high mortality. To these we must add the well-known diseases—measles and whooping-cough, infectious sore throats, diphtheria, scarlet fever, and some more rare and even more serious—meningitis and infantile paralysis.

All mothers at the approach of winter, if not before, should consider seriously what they can do to protect their children from these infections. No good is done by ''coddling'' or over-clothing. School children cannot escape the risk of infection, nor can infections be prevented altogether. That is impossible, but much can be done to make them less frequent, to diminish the severity of their attacks, and to prevent them from leaving behind weakness and ill-health. This can be done in two ways—(1) by increasing the child's resistance to infections, (2) by lessening the number of infections.

### Protective Foods.

To increase the resistance the child should be in vigorous health, not only apparently healthy, but with all his tissues strengthened against disease. This depends on right feeding with the right foods containing liberal supplies of the vitamins necessary for health. Milk, eggs, and green vegetables are the protective foods, and unless wholemeal bread is always used, each day should have its dessert or tablespoonful of cooking bran at school age. Should the child be weakly he should be given cod liver oil, either plain or in emulsion. If he has a strong dislike to this, he may obtain the same benefit from ''Radiomalt'' (a pleasant sweetmeat) or some other substitute that his doctor may recommend.

### How Infectious Diseases are Spread.

Infectious diseases are spread only occasionally by those who are sick in bed. The infection is most often distributed by mild cases, convalescents, and many persons who are apparently healthy, but are carriers of the disease germs. During an epidemic these last are numerous, and all persons should be suspected of being carriers. By coughing, sneezing, and even loud-speaking an invisible spray is ejected containing the disease germs. These extremely minute particles float like a light mist, especially in closed rooms and halls in cold weather, where there is little ventilation. It is easy to understand how the disease is inhaled by others. Where there is no cough, another method of infection comes into prominence. Most young children are in the habit of putting their fingers into their mouths and smearing their secretions on their clothes and toys, and on the hands, faces, clothes, and toys of their playmates. In this way disease germs are rapidly distributed among any group of young children. This dangerous habit of slobbering and smearing persists because of want of proper training in the home. Mothers have not yet learnt how dangerous it may be. Prevention of infection by coughing is more difficult, but even young children may be taught to cough into handkerchiefs and not into other people's faces.

### Give the Baby a Chance.

Nearly everyone contracts measles and whooping-cough some time or other, but the chief mortality results are in the early years of life, so that every year in which the child escapes them, improves the prospects of recovery. Measles is rare in the first year, but whooping-cough is often fatal to young and weakly infants. Diphtheria infection is almost universal in childhood, though only a small proportion develop this dangerous disease; the others become immunised. By artificial immunisation the disease can be prevented more safely, and many lives saved. ''Colds'' and influenzas give no lasting protection, and there is no limit to the number of the attacks. Every effort should be made to protect the youngest. A baby who is handed round to all visitors to be hugged and kissed has little chance of escape. Crowded halls are sure to be centres of infection when this is about, and therefore babies and young children should not be taken to dances and picture-shows. This may entail some self-sacrifice on the part of the mother; but what is a mother for, if not for that?

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## BREAD-MAKING.

SOME useful hints on a question of wide interest to country housewives were given in an address by Miss Valeria Holcombe, secretary of Burren Junction Branch of the Country Women's Association, at a conference of the N.S.W. Agricultural Bureau, and which are quoted below:—

A good bread-making flour is essential; some flours make excellent cakes and puddings, but are not good for bread-making. This is because bread requires a flour containing plenty of gluten. Some varieties of wheat make a flour low in gluten content and these are not suitable for bread.

Yeast works best at temperatures of from 77 to 95 deg. Fahr. Keep the dough near the stove in cold weather and during heat waves put in cool place or it will rise too quickly and give a loaf that is too porous. Yeast will not work below 30 deg. Fahr., and is killed at 212 deg. Fahr. Salt retards the action of the yeast slightly; it should not be added till the dough is working well.

A little sugar improves the loaf. It prevents the crust from being too hard. The water or milk used to mix the bread with should be scalded and then allowed to cool down to lukewarm—about 103 deg. Fahr. Milk makes a very nutritious loaf with white crumb and rich crust. If all milk cannot be used try half milk and half water.

Cook for one hour; start with a hot fire (400 deg.) and decrease the temperature after a while. The cooking drives off the carbon dioxide and kills the yeast plant, so that it does not rise any more.

### Troubles in Bread-making.

Over-kneaded dough is sticky and will not rise; under-kneaded dough is streaky and the bread will contain lumps of dough that have not been worked out.

Too much flour gives too stiff a dough, rises very slowly, and the flavour will be poor.

Too long a rising will give a porous loaf with poor flavour. If the rising continues too long, the bread will settle over the side of the tin or become sour.

Too cool an oven will make the bread rise too long and it will be too porous.

''Rope'' is caused by a bacillus; it often appears in hot, damp weather. When the bread is about a day old the crumb goes stringy or ropey and the flavour is so disagreeable that it is quite unfit for use. This disease is hard to get rid of. The treatment is to sterilise all utensils, and add vinegar equal to 2 per cent. (one tablespoon vinegar to 1½ lb. flour) of the flour used, for all the remaining flour you have.

### Recipes for Yeast.

Yeast is a microscopic plant, which, when given food, air, warmth, and moisture multiples very rapidly and produces carbon dioxide; this stretches the gluten and the dough rises. There are three main kinds of yeast. Compressed yeast comes in small damp cakes; it is ready to work immediately it is given the food and moisture, &c., and will keep in good condition two or three days. Dry yeast is a mass of yeast plants dried and mixed with some kind of meal. Although alive,

it is inactive, and even after it has been given the food, warmth, and moisture it takes some hours to start working well. It is sold in tins and will keep some months. Liquid yeast may be made at home as follows:—

*Cream of Tartar Yeast.*—Put 1 heaped tablespoon of hops in a saucepan with 4 cups water and boil twenty to thirty minutes. Put 1 tablespoon sugar, 1 teaspoon cream of tartar into a basin, strain the boiling hop water on to it and stir; when cold mix with 3 tablespoons flour and add 1 tablespoon old yeast. Put in basin, cover with plate, and keep in a warm place near the stove for twelve to eighteen hours. It is then ready for use. Stand in a cool place, and it will keep for a week or ten days in cool weather. Use three-quarters of a pint of this to make 3 to 5 lb. bread.

*Potato Yeast.*—Materials: Three potatoes, two pints boiling water, half cup flour, one-quarter teaspoon ginger, one tablespoon sugar, one and a-half tablespoons salt, half cup old yeast. Peel the potatoes, cut small, cook in the boiling water, mash potatoes. Mix next four ingredients and pour over them the potatoes and water in which they have been cooked. When lukewarm add old yeast. Keep lukewarm for twenty-four hours, put into basin, cover, and keep in cool place. Will keep two weeks.

Neither of these yeasts requires bottling or cooking.

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## LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included, they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

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## FLOWERING SHRUBS.

*Lagerstrœmia indica* varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana;* the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20 ft.

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river

side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia; now they are rarely seen. *G. Thumbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and not having the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only; yet they grow just as well here as in the North. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madonna," and carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine-coloured variety and the canary-yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

## TRANSPLANTING FRUIT TREES.

The transplanting of partially developed fruit trees is seldom attempted on account of the risk of failure and the trouble entailed in endeavouring to retain sufficient fibrous roots to ensure a reasonable prospect of success. Trees up to five or six years old, where subject to the necessary preliminary treatment, can not only be removed without risk of failure, but transported satisfactorily over long distances. It will be recognised that the sustenance of the plant is absorbed by the small or fibrous roots in the immediate vicinity of their terminals, and by inducing a profusion of these within a short radius of the stem the chances of failure are practically nil. A profusion of small roots may be ensured by cutting through at the desired distance from the stem (15 to 24 inches, according to the size of the tree) all roots to a depth of 18 inches. In so doing a trench is made around the tree, and the ends of roots carefully pared if the cutting has not been "clean." The trench is then refilled with soil containing a good supply of humus, and in about three months' time the original root ends will have developed a good supply of fibres. At the time of removal these are not interfered with more than can be avoided, the necessary excavation for removing the tree from its original position and severance of any lower roots being made beyond the terminals of the young root growth. The head of a large tree should be materially shortened at the time of removal. The cutting of roots in the first instance should be performed when the tree is in a dormant state; in the case of citrus, conditions are generally favourable about March. Tropical varieties handled in this manner can be removed at almost any time after sufficient roots have formed and hardened, and may be first treated at any time of the year at the period known as "between growths."—GEO. WILLIAMS, Director of Fruit Culture.

## FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and

sawing, when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberroses, amaryllis, pancratium ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

## KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnips, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top-dressing, where vegetables have been planted out with fine stable manure, has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

## THE CARE OF THE LAWN.

For a lawn to be a success it must be carefully made in the first place. Good drainage is essential, for stagnant water-logged soil encourages weeds and kills the grass. The soil should be rich in plant food. Give the ground a heavy dressing of good manure, and thoroughly dig it over. Enough time should then be allowed for the soil to settle, as it must be firm when the grass is planted or there will be a series of hills and hollows shortly after. In addition to the manure apply the following mixture at the rate of 3 oz. to the square yard, forking or raking it well into the top spit of the soil:—2 lb. superphosphate of lime, 1 lb. bonemeal, and 1 lb. sulphate of ammonia.

Early in the spring, as the grass begins to grow, a heavy roller should be passed several times over the ground.

Lawns showing bare patches will require a dressing during the autumn, and the mixture previously mentioned will be found very suitable, and will keep the grass well nourished. Wood ashes and soot, combined or not, will also be found beneficial. All dressings should be applied during showery weather. If soil poverty is the cause of a patchy lawn, it is best to rake over in the autumn with a sharp-toothed rake, and dress with a good layer of fine soil and wood ashes.

**If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.**

# Farm Notes for August.

LAND which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from diseases; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before rebagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

# Orchard Notes for August.

## THE COASTAL DISTRICTS.

THE bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin, which in coastal lands is invariably disposed to produce a profusion of branches, with consequent over-production and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality. Where white louse is present on the main stem (where it almost invariably makes its first appearance) or branches, spraying with lime sulphur solution in the proportion of one part of the concentrate to ten parts of water after the centre of the tree has been opened up by pruning will be found most beneficial.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot, and in the North Coast district particularly, for the presence of the weevil root-borer which may attack the roots in the vicinity of the thin bases or at some feet distant. A very light application of paradichlor, buried a few inches under the soil in circles around the tree and the surface stamped firm, is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches. It may be necessary to repeat the application at three to four weeks' intervals.

Spraying with Bordeaux mixture is desirable as it will, if properly applied, destroy the spores of various fungi later attacking both foliage and fruit.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back—in fact, the whole of the top removed, leaving only a few selected ''arms'' of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 feet according to the size of the tree, will form the future head of the tree, and from these numerous shoots will originate; these shoots in turn are reduced according to

circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for reinfestation is available throughout the orchard.

Working the land is essential, and disc implements give best results. Before ploughing it is advisable to apply the necessary fertilizer, not just around the trees beneath the branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken; the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requirements. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertilizer or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The attention of citrus growers should be confined mainly to good varieties like Jaffa and Siletta, with a lesser quantity of late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour; also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lie about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internode to protrude. Growth is only desired from the upper or exposed bud.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELAND.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

Late spraying against San José scale where present should be applied with an efficient oil emulsion before any growth appears. Each particular brand has its advocates. Where the scale is persistent a 2 per cent. solution of Volck may be applied subsequent to the appearance of foliage. Both of these sprays are efficacious against peach or other aphis at a much reduced strength. One per cent. has given satisfactory results. The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock.

# RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY, 1933 AND 1932, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. May. | Average Rainfall. No. of Years' Records. | Total Rainfall. May, 1933. | Total Rainfall. May, 1932. |
|---|---|---|---|---|
| | In. | | In. | In. |
| *North Coast.* | | | | |
| Atherton | 2·10 | 32 | 2·05 | 6·65 |
| Cairns | 4·49 | 51 | 4·59 | 11·76 |
| Cardwell | 3·59 | 61 | 5·26 | 7·97 |
| Cooktown | 2·87 | 57 | 0·95 | 3·68 |
| Herberton | 1·64 | 47 | 3·47 | 4·97 |
| Ingham | 3·56 | 41 | 6·32 | 10·97 |
| Innisfail | 12·30 | 52 | 8·85 | 19·57 |
| Mossman Mill | 3·79 | 20 | 4·17 | 10·53 |
| Townsville | 1·31 | 62 | 0·48 | 2·25 |
| *Central Coast.* | | | | |
| Ayr | 1·15 | 46 | 0·61 | 3·04 |
| Bowen | 1·32 | 62 | 1·07 | 2·16 |
| Charters Towers | 0·80 | 51 | 0·37 | 1·61 |
| Mackay | 3·75 | 62 | 1·32 | 5·33 |
| Proserpine | 4·32 | 30 | 4·58 | 6·95 |
| St. Lawrence | 1·79 | 62 | 0·64 | 3·21 |
| *South Coast.* | | | | |
| Biggenden | 1·72 | 34 | 0·64 | 1·23 |
| Bundaberg | 2·65 | 50 | 0·98 | 2·09 |
| Brisbane | 2·78 | 82 | 0·55 | 1·66 |
| Caboolture | 2·87 | 46 | 0·00 | 1·23 |
| Childers | 2·13 | 38 | 0·55 | 1·14 |
| Crohamhurst | 4·94 | 40 | 0·40 | 2·38 |
| Esk | 1·97 | 46 | 0·21 | 0·77 |
| Gayndah | 1·56 | 62 | 0·25 | 1·11 |
| Gympie | 2·86 | 63 | 0·69 | 1·36 |
| Kilkivan | 1·83 | 54 | 0·62 | 0·56 |
| Maryborough | 3·05 | 61 | 0·95 | 1·17 |
| *South Coast—continued—* | | | | |
| Nambour | 4·73 | 37 | 1·03 | 2·34 |
| Nanango | 1·52 | 51 | 0·26 | 0·91 |
| Rockhampton | 1·66 | 62 | 0·47 | 3·15 |
| Woodford | 2·91 | 46 | 0·02 | 1·11 |
| *Darling Downs.* | | | | |
| Dalby | 1·29 | 63 | 0·23 | 0·55 |
| Emu Vale | 1·19 | 37 | 0·39 | 0·83 |
| Jimbour | 1·19 | 45 | 0·32 | 0·73 |
| Miles | 1·49 | 48 | 0·14 | 1·04 |
| Stanthorpe | 1·87 | 60 | 1·17 | 1·12 |
| Toowoomba | 2·19 | 61 | 0·71 | 1·12 |
| Warwick | 1·56 | 68 | 0·42 | 0·85 |
| *Maranoa.* | | | | |
| Roma | 1·43 | 59 | 0·20 | 2·16 |
| *State Farms, &c.* | | | | |
| Bungeworgorai | 0·94 | 19 | 0·10 | 2·44 |
| Gatton College | 1·55 | 34 | 0·45 | 0·52 |
| Gindie | 0·93 | 34 | .. | 1·32 |
| Hermitage | 1·24 | 27 | 0·34 | 0·66 |
| Kairi | 1·96 | 19 | 2·82 | 4·85 |
| Mackay Sugar Experiment Station | 3·28 | 36 | 1·72 | 4·52 |

GEORGE E. BOND, Divisional Meteorologist.

## TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

# ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

| | July. 1933. | | August. 1933. | | MOONRISE. July. 1933. | MOONRISE. Aug. 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| 1 | 6·45 | 5·7 | 6·35 | 5 21 | a.m. 11·38 | p.m. 12·19 |
| 2 | 6·45 | 5·7 | 6·34 | 5·22 | p m. 12·10 | 1·18 |
| 3 | 6·45 | 5·7 | 6·33 | 5·22 | 12·47 | 2·24 |
| 4 | 6·45 | 5·7 | 6·33 | 5·23 | 1·33 | 3·33 |
| 5 | 6·45 | 5·7 | 6·32 | 5·24 | 2·31 | 4·43 |
| 6 | 6·45 | 5·7 | 6·32 | 5·24 | 3·35 | 5·52 |
| 7 | 6·45 | 5·8 | 6·31 | 5·25 | 4·46 | 7·8 |
| 8 | 6·45 | 5·8 | 6·31 | 5·26 | 5·58 | 8·0 |
| 9 | 6·45 | 5·9 | 6·30 | 5·26 | 7·5 | 9·2 |
| 10 | 6·44 | 5·9 | 6·29 | 5·26 | 8·13 | 9·56 |
| 11 | 6·44 | 5·10 | 6·28 | 5·27 | 9·17 | 10·53 |
| 12 | 6·44 | 5·11 | 6·27 | 5·27 | 10·14 | 11·52 |
| 13 | 6·44 | 5·11 | 6·26 | 5·28 | 11·11 | .. |
| 14 | 6·43 | 5·12 | 6·25 | 5·28 | .. | a.m. 12·47 |
| 15 | 6·43 | 5·12 | 6·24 | 5·29 | a.m. 12·8 | 1·40 |
| 16 | 6·43 | 5·13 | 6·23 | 5·29 | 1·4 | 2·34 |
| 17 | 6·42 | 5·13 | 6·23 | 5·30 | 2·0 | 3·26 |
| 18 | 6·42 | 5·14 | 6·22 | 5·30 | 2·53 | 4·12 |
| 19 | 6·42 | 5·14 | 6·21 | 5·31 | 3·49 | 4·57 |
| 20 | 6·41 | 5·15 | 6·20 | 5·32 | 4·42 | 5·37 |
| 21 | 6·41 | 5·15 | 6·19 | 5·32 | 5·33 | 6·10 |
| 22 | 6·41 | 5·15 | 6·18 | 5·33 | 6·19 | 6·40 |
| 23 | 6·40 | 5·16 | 6·17 | 5·33 | 7·0 | 7·10 |
| 24 | 6·40 | 5·16 | 6·16 | 5·34 | 7·38 | 7·42 |
| 25 | 6·39 | 5·17 | 6·15 | 5·34 | 8·7 | 8·13 |
| 26 | 6·39 | 5·17 | 6·14 | 5·34 | 8·39 | 8·47 |
| 27 | 6·38 | 5·18 | 6·12 | 5·35 | 9·9 | 9·26 |
| 28 | 6·38 | 5·18 | 6·11 | 5·35 | 9·39 | 10·14 |
| 29 | 6·37 | 5·19 | 6·10 | 5·35 | 10·12 | 11·9 |
| 30 | 6·37 | 5·19 | 6·9 | 5·36 | 10·48 | 12·11 |
| 31 | 6·36 | 5·20 | 6·8 | 5·36 | 11·30 | 1·16 |

## Phases of the Moon, Occultations, &c.

| | | | |
|---|---|---|---|
| 7 July | ○ | Full Moon | 9 50 p.m. |
| 14 ,, | ☽ | Last Quarter | 10 23 p.m. |
| 23 ,, | ● | New Moon | 2 3 a.m. |
| 30 ,, | ☾ | First Quarter | 2 43 p.m. |

Perigee, 6th July, at 10·24 p.m.
Apogee, 19th July, at 9·20 a.m.

On 2nd July the Earth will be in Aphelion, 94,450,000 miles from the Sun, or 3,120,000 miles further away from it than on 3rd January.

Mercury will be at its greatest elongation 26 degrees east of the Sun on the 2nd, and will then remain above the horizon for nearly 2 hours after sunset.

Between 9 and 10 p.m. on the 9th Saturn will be occulted by the Moon. Observers should look out at an early hour for Saturn on the eastern side of the Moon, which two days after being full will make Saturn less conspicuous.

The Moon will be passing Uranus soon after midday on the 15th when Uranus is 5 degrees to the southward.

On the 25th Venus and the Moon, only 2 degrees apart, will rise soon after 8 a.m., but too near the Sun to be visible.

The Moon will be passing 2 degrees south of Neptune at 7 a.m. on the 26th.

On the 27th at 8 a.m. the Moon will be passing 4 degrees southward of Jupiter. The Moon will not rise till after 9 a.m., but it will be interesting to look for Jupiter and the young Moon.

Mercury will be at inferior conjunction with the Sun on the 30th, its distance from the Earth being 55,953,000 miles.

Mercury sets at 7.4 p.m. on the 1st and at 6·53 p.m. on the 15th.

Venus sets at 6·30 p.m. on the 1st and at 6.54 p.m. on the 15th.

Mars rises at 11·7 a.m. and sets at 11·7 p.m. on the 1st: on the 15th it rises at 10·33 a.m. and sets at 10.46 p.m.

Jupiter rises at 10.44 a.m. and sets at 10.20 p.m. on the 1st; on the 15th it rises at 9.55 a.m. and sets at 9.34 p.m.

Saturn rises at 7.51 p.m. and sets at 9.11 a.m. on the 1st; on the 15th it rises at 6.53 p.m. and sets at 8.12 a.m.

The Southern Cross will be erect on the southern meridian (position XII. about 6 p.m. on 1st July, and about 4 p.m. at the end of the month if the observer is near the 150th meridian.

| | | | |
|---|---|---|---|
| 6 Aug. | ○ | Full Moon | 5 31 a.m. |
| 13 ,, | ☽ | Last Quarter | 1 49 p.m. |
| 21 ,, | ● | New Moon | 3 47 p.m. |
| 28 ,, | ☾ | First Quarter | 8 13 p.m. |

Perigee, 4th Aug., at 2.36 a.m.
Apogee, 16th Aug., at 12.48 a.m.
Perigee, 31st Aug., at 3.30 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

# QUEENSLAND AGRICULTURAL JOURNAL

VOL. XL. 1 AUGUST, 1933. PART 2.

## Event and Comment.

### A Great Agricultural Show.

RIGHTLY regarded as the most important event in Queensland's agricultural year, Brisbane's great August festival promises to surpass all previous Exhibitions of the Royal National Association. In a message of goodwill, in the course of which he pays a very fine tribute to this State, the Governor-General, Sir Isaac A. Isaacs, says:—

> Queenslanders have in their more intimate charge a section of this continent that has its own special advantages and inherent responsibilities. With scientific experiment and advance, business methods, and reasonable distributive facilities there is every reason to hope that in the near future Queensland will prove one of the most important gateways of mutually advantageous inter-Imperial commerce. Side by side with this great object Queenslanders are constantly offering to the world, if it will pay atttention, unanswerable proof that there is nothing in the climate or other natural conditions of their State that the stamina and courage of Australians cannot meet and conquer. For all this, past Shows have given, and I am confidently expecting the coming Show will again give the most satisfactory confirmation.

The Premier, Mr. W. Forgan Smith, too, pays a high tribute to the primary producers of the State, who through hard work and enterprise have made the annual Show in Brisbane such a great feature of our national life, and adds:—

> The Exhibition affords the opportunity to all sections of the people of fully appreciating the value of the great natural resources of the State. We can thus realise the part that Queensland is contributing towards the development of this young Commonwealth, and be justly proud of the accomplishments of the citizens of the State.

### Country and City United.

"A WEEK of fresh inspiration, of splendid realisation—a week of praise and thanksgiving to a generous Providence. The city and the country join hands, and each is enriched by the union." In expressing those thoughts in his pre-Show message, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, epitomises

popular sentiment. The Show was made possible, he said, by those people who have realised that the industry and enterprise of a great State are worthy of a noble setting. "The Exhibition is agricultural history in the making, and citizens will read with pride a great record of sustained achievement."

## Departmental Display.

CHIEF of the pavilion displays this year is the Court of the Department of Agriculture and Stock. While the whole Show may be described as a working model of the State, the Departmental Court may be said to be a working model of the Show. It is a well-organised and artistic display, educational in aim and designed to represent the work of the scientific, technical and field staffs, and to demonstrate, by the meticulous care taken in the technique and arrangement of the exhibits, that a high standard of departmental efficiency in dealing with the many and varied problems of primary production has been attained. A country's progress in agriculture and stock raising is dependent now more than ever on the linking of science with practice. Proof of the soundness of that assertion may be observed throughout every section of the Court of Agriculture. These sections embrace a varietal display of sugar-cane; a wheat-breeding and grain exhibit; maize breeding and seed selection; root crop cultivation; broom millet, sorghums, and other fodder plants; separate wool and cotton displays; native grasses and edible herbs; weeds and suspected poisonous plants; illustrations of the work of the Pure Seeds Branch; pig and poultry raising exhibits; and the "Queensland Agricultural Journal" information bureau.

In the pig industry section is another example of the intensive instructional campaign which the Department is conducting throughout the State for the assistance of primary industry generally.

The dairying section is housed this year in the new Dairy Hall, near the Meat Industry Hall, where an excellent display covers every phase of dairy science and practice.

The merits of the different varieties of cotton in cultivation under Queensland conditions, as discovered in careful departmental tests and by observation over a long period, are disclosed in the cotton division. Much valuable technical information is graphically set out, and there is an attractive arrangement of the various stages of production—the plants, the cotton bolls, the seed cotton, ginned lint, cotton, baled cotton, and the by-products of the seed, oil and meal.

In pursuance of Government policy to aid in every possible way those engaged in tobacco growing, and also in so interesting the man in the street that he will smoke Queensland leaf, there are settings devoted to the culture, the curing, the grading, and other treatment of the leaf and its manufacture.

Peanut production and the demonstration of the ramifications and potentialities of that side of agricultural effort is a new feature.

Notable wheat-breeding and other cereal experiments have been carried out by the Department for many years, and much of the result of this work is available for public scrutiny at the Show. In the cereal section, as in many of the other departmental sections, a great preponderance of the exhibits are the products of State experiment farms and associated areas, and the highly scientific methods of culture and other treatment there applied are reflected in the high quality and attractiveness of the exhibits arranged. Every possible form of rural production is represented.

The effective work of the Entomological and Plant Pathological branches in evolving and applying the means of combating insect, fungoid, and other pests are placed before visitors in a striking way, showing what tremendous losses in agricultural, vegetable, and fruit production are constantly being averted by the work of the scientist. What will be very largely a new presentation is that of the State Animal Health Station. The methods of study, the prevention, the treatment and cure of diseases in animals, which are illustrated, should be of great value to every stockowner, and enlightening also to the public.

## Science and the Farmer—Work of the Department Appreciated.

SCIENCE as applied to agriculture is rapidly transforming the great agricultural industries of Australia, resulting in a high standard of farming efficiency, with consequent improvement in the quality of our primary products. On this subject the "Brisbane Courier" comments interestingly as follows:—

Australia may at some future date adopt large-scale farming, but there is little to indicate, in the present-day trend of development, a radical departure

from the one-man farm. But whether farming be on a large or small scale, improved technique, due to the application of science to agriculture, calls for a higher standard of efficiency among farmers.

Just as the manufacturer with an obsolete plant cannot hope to compete with a factory possessing modern equipment, so is it impossible for the haphazard-farming methods of a few decades ago to win a reasonable livelihood for the man on the land. Scientific progress in agriculture, therefore, has brought about a transformation in the farmer himself. His calling is more exacting, and demands from him a degree of skill which his forefathers did not possess.

In our own State of Queensland the Department of Agriculture and Stock is the hand that guides the farmer to a better knowledge of his requirements. The research work of that department is directed towards educating him in all that appertains to his work. Over thirty graduates of the Queensland University are engaged in the Department's scientific services, and its field officers are, in the main, the product of the agricultural colleges of the Commonwealth. Given a farming community with a low cultural level, and the work of these officers would be of little avail; hence the degree of advancement in scientific knowledge requires a correspondingly high standard of intelligence among those for whom the research is undertaken.

There is, therefore, no place in the primary industries to-day for the illiterate and superstitious peasant of tradition. He must be able to equip himself with the knowledge available—and necessary to keep him in step with progress.

A realisation of the community of interests of those engaged in land pursuits also exercises a strong influence for progress. The farmer is naturally an individualist, and is usually conservative to a degree. His condition of life makes him so. But the pressure of competition in the markets wherein he disposes of his product has driven him to the acceptance of co-operation, of pooling, of organised marketing, of association with his fellows, in tackling the manifold problems which confront him from day to day. This coming together is sure to lead to greater efficiency. Planned production and distribution are better than the old anarchic method by which each produced according to his whim, and took his chance on the available market. We have evidence of this drive for planning in the case of three of Australia's greatest products—wheat, wool, and butter. Once that idea takes firm hold its extension over the whole field of primary production is brought within the bounds of probability.

This emergence from the state of individualism is by no means the least of the changes which modern developments have brought into the life of the farmer. Its great importance lies in the fact that it makes for organisation and regulation, two factors that are destined to play a predominant part in the economics of all countries.

## Co-operation of Farmers with the Department.

BENEFITS to be derived from co-operation between producers and the Department were emphasised by the Minister for Agriculture and Stock (Mr. F. W. Bulcock) when addressing a representative party of dairy farmers recently.

He said that the problems confronting the dairying industry to-day were, perhaps, more serious than at any time in the history of the industry. So long as everything was done to maintain high standards of production Queensland had nothing to fear. For some considerable time the Paterson scheme had been in force, but there was no present prospect of that scheme surviving very much longer. Australia was not responsible for market fluctuations in London, for the industrial conditions in Australia did not change so rapidly as the conditions governing the English market. The Department was busy on the substitution of another scheme, and the Queensland Government was prepared to assist as far as possible in any sound project for the stabilisation of the Australian price.

It had been suggested that the leaders of the dairying industry should be brought together from time to time to discuss the position of the industry. There were two forms of contribution, one the financial and the other the intellectual, and what was wanted was intellectual contribution. The members of the dairy science school now assembled in Brisbane would be able to see what the Department was doing, how men were being trained to assist the farmers, and how establishments were being maintained for that purpose.

# Bureau of Sugar Experiment Stations.

## CANE PESTS COMBAT AND CONTROL.

### ENTOMOLOGICAL NOTES FOR AUGUST.

By EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

### OCCURRENCE OF BOTH GRUBS AND PUPAE IN SUBTERRANEAN CELLS.

AUGUST marks the commencement of a decided lull in the activity of this cane insect, which for the time being has lapsed into a condition of torpidity and disappeared from view. Its grubs, after forming their pupal cells, can now be found either lying in them with shrunken straightened body, or awaiting in the form of pupæ that call to a wider sphere of action than that experienced by the grub or its mummy-like pupa.

At this time of the year growers should make a careful inspection of affected areas, to determine if possible the reason for such invasion of this cane beetle. In the event of a belt or clump of timber containing food plants of the beetle chancing

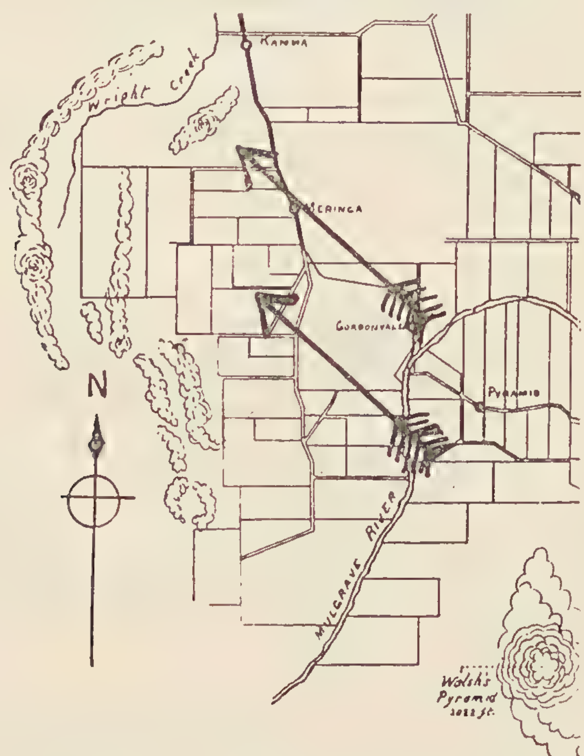


PLATE 15.—A small pocket of cane land near Meringa partially encircled by mountainous country. The arrows show direction of trade wind, and of migrating greyback cockchafers chancing to travel with same.

to occur in the midst of a plantation or to separate two adjacent fields and to lie in a south-westerly situation, within a mile from the southern headland, such trees should be cut down.

Similarly, when either of the opposite sides of an area of cane land happens to run in a north-easterly direction and to be closely bounded by forest country, it often becomes advisable to cut out all feeding trees growing near such headlands to a distance of at least half a mile from the nearest rows of cane. On the other hand, when the southern edge of a canefield is bounded closely by forest land extending far to the southward, it is *not* advisable to clear a belt of timber back from such headlands, or to cut down the feeding trees.

Should grubs occur over an area of caneland chancing to be more or less surrounded on all quarters except the south by timbered mountain ranges, destruction of the food plants of this beetle would, if practicable, not only entail considerable

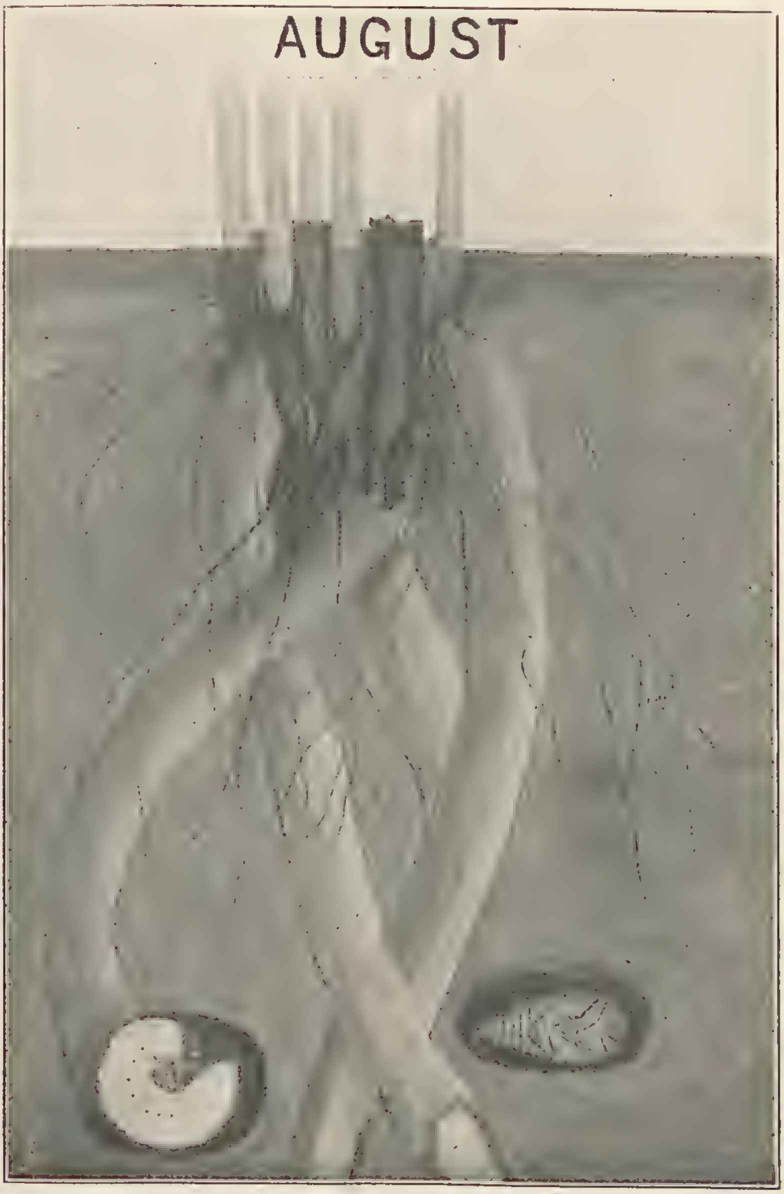


Plate 16.—Showing pupation of grubs of the greyback cane-beetle; and a pupa of same in its resting or pupal chamber.

labour and expense, but be likely in many cases to prove ineffectual as a control measure. Such cul-de-sacs or large pockets usually become grub-infested in the first place as a result of the arrival of greybacks migrating from the south-east which are forced to come to rest finally upon timber fringing the basal portions of these ranges. Finding the situation favourable for breeding purposes, and that further progression towards the north, east, and west is obstructed by mountainous country, they generally become established in such localities and regularly damage the cane each season.

In the case of permanent infestations of this kind, the best plan of procedure would be to try to prevent excessive multiplication of these beetles by collecting them during each flighting period either from native food plants or from trap-trees grown for such purpose, and by picking up the grubs during the course of cultural operations. By exercising common-sense methods of this kind on such cane areas it should be possible to reduce the grub pest to harmless proportions, seeing that the fields are practically closed from invasion from all quarters but the south.

### Economic Significance of the Pupal Period.

Apparently the most important phase in the life-cycle of our greyback cockchafer from an economic point of view is that of its pupal condition, which happens to be passed underground at depths varying from 6 to 15 or more inches. Although occupying a position so well calculated to exclude possibility of attack from predaceous insects or other enemies, these beetles, after transforming to the winged state about six weeks later, unfortunately find themselves practically imprisoned in their subterranean cells, from which escape is often impossible until the surrounding hard dry soil becomes sufficiently softened by heavy rain to enable them to reach the surface. Now, it is all important that, just before and for some time after pupation of these grubs in June or July, the rainfall should continue to be normal throughout a period of five months (June to October) in order that such transformation may take place at the proper depth, and the soil remain moist until commencement of the flighting season. In the event of abnormally dry conditions prevailing during these months, coupled with a precipitation far below the average throughout the preceding period of January to May, a check to the activities of this species must assuredly follow.

Should such adverse climatic conditions, however, be continued through November and December, the check sustained is likely to be very severe, causing enormous numbers of these cockchafers to perish hopelessly in their underground pupal chambers.

It appears, therefore, from available data obtained during a period of about thirty years that heavy annual rainfalls are not, as some growers imagine, invariably followed by serious grub infestation; such outbreaks of this pest being usually determined, as pointed out above, by the quantity of rain chancing to fall during what should be known as the *critical period*, occupied by its pupal and early beetle conditions.

### Change from Grub to Beetle.

An examination of pupal cells below grub-infested stools growing on high land canefields in August, 1925, revealed pupæ and newly-emerged greybacks in about equal proportions; the soft condition of the latter indicating that transformation to the adult beetle had occurred in these cells about a fortnight earlier. In this instance pupation (change from grub to pupæ) had taken place late in June at an average depth of 14 inches, thus indicating that the soil at the time contained less moisture than is usual for that month.

During the subterranean life of this insect profound physiological changes occur. While the outer body-case of the future beetle is gradually hardening, the entire interior anatomy of the pupa, including muscular, nervous, and other systems, are becoming liquefied; this fluid matter giving rise later on to totally different structure, designed to meet conditions to be encountered during the course of its winged or perfect state.

The diagrammatic sketch for August indicates the downward trend of tunnels made by mature fully-fed grubs after forsaking the cane roots. At the bottom of plate a pupa and a grub nearing transformation are lying in cells; while the anal segment of one of the latter, seeking lower depths, is just disappearing.

# In Memoriam.

## CHARLES QUEALE.

WITH deep regret we record the passing of Mr. Charles Queale, an efficient and highly respected officer of the Department of Agriculture and Stock, who died at his residence, Moolabin, Villa street, Annerley, on Sunday, 11th June. He was born in 1868 at Woodlands, on the Brisbane River, and consequently was in his sixty-fifth year of age.

His father was the late Mr. Charles Queale, who arrived in Queensland by the ship "Vernon" from Ireland in May, 1864, and took up land on the Brisbane River, where he carried on farming for many years.

Mr. Queale was the youngest of a family of seven, an elder brother being the late Mr. Robert Queale, well known in business circles in Brisbane and the Darling Downs for over fifty years.

On leaving school Mr. Queale assisted his father on the farm for some years, and later, in 1907, joined the Department of Agriculture and Stock as a Dairy Inspector, and was first stationed at Boonah, and since that time has been engaged as a Dairy Inspector and Stock Inspector in various parts of Queensland, in all of which places he gained the high esteem of all who came in contact with him, and was always recognised as a most zealous and capable official.

He was a man of high culture and had a wide knowledge and a wide appreciation of the best in literature. He wielded a ready pen both in prose and in verse.

The late Mr. Queale had democratic views in political thought, and in the early days before the advent of the Labour Party as it is known to-day, did great work for the cause he believed in as a member of the Old Democratic Vanguard, and with such able pioneers in the movement as Mr. John Huxham, Mr. T. L. Jones, and Mr. Max Ramsay, helped to lay the foundations of the Queensland branch of the Australian Labour Party. He also took an active interest in union matters, and for some years was a member of the Council of the Queensland Government Professional Officers' Association, representing the Department of Agriculture and Stock on that body.

In his younger days he was noted for his very fine physique and an excellent record in the field of athletics, particularly as a high jumper and long-distance runner. The possessor of a most likeable personality and an idealism that remained undimmed throughout his life, he had a large circle of friends among all classes of the community, who cherish dearly the memory of a happy nature and a man of the highest integrity and honour. He was an ardent student of nature, and found never-ending pleasure in the contemplation of her beauties.

The late Mr. Queale is survived by a widow, one son, and three daughters. His son, Mr. Alan Queale, is on the staff of the Queensland Mines Department at Mount Isa. Two daughters are nurses in the Brisbane General Hospital, and the other is an art student at the Central Technical College.

The late Mr. Queale was laid to rest on 12th June in St. Matthew's, Church of England, Cemetery at Sherwood in the presence of a large gathering, including many of his old colleagues. The Minister for Agriculture and Stock, Hon. Frank W. Bulcock, was represented by Mr. E. Graham (Under Secretary and Director of Marketing); and among others present were Messrs. R. Wilson (Assistant Under Secretary), R. P. M. Short (Chief Clerk), Major A. H. Cory (Chief Inspector of Stock), and Mr. H. Iliff (Deputy Registrar of Brands).

Our sincere sympathy is extended to his sorrowing family.

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## JOHANNES CHRISTIAN BRUNNICH.

IT is with great regret that we also have to record the death at his home at Taringa on 3rd July of Mr J. C. Brünnich, F.C.S., F.I.C., F.A.C.I., who was one of the most distinguished agricultural chemists in the Southern Hemisphere, and who, up to the time of his retirement in September, 1931, had performed

invaluable service to the State. The late Mr. Brünnich, who was seventy-two years of age, suffered from a stroke a few days previously, from which he never rallied. Before his retirement he was Agricultural Chemist to the Department

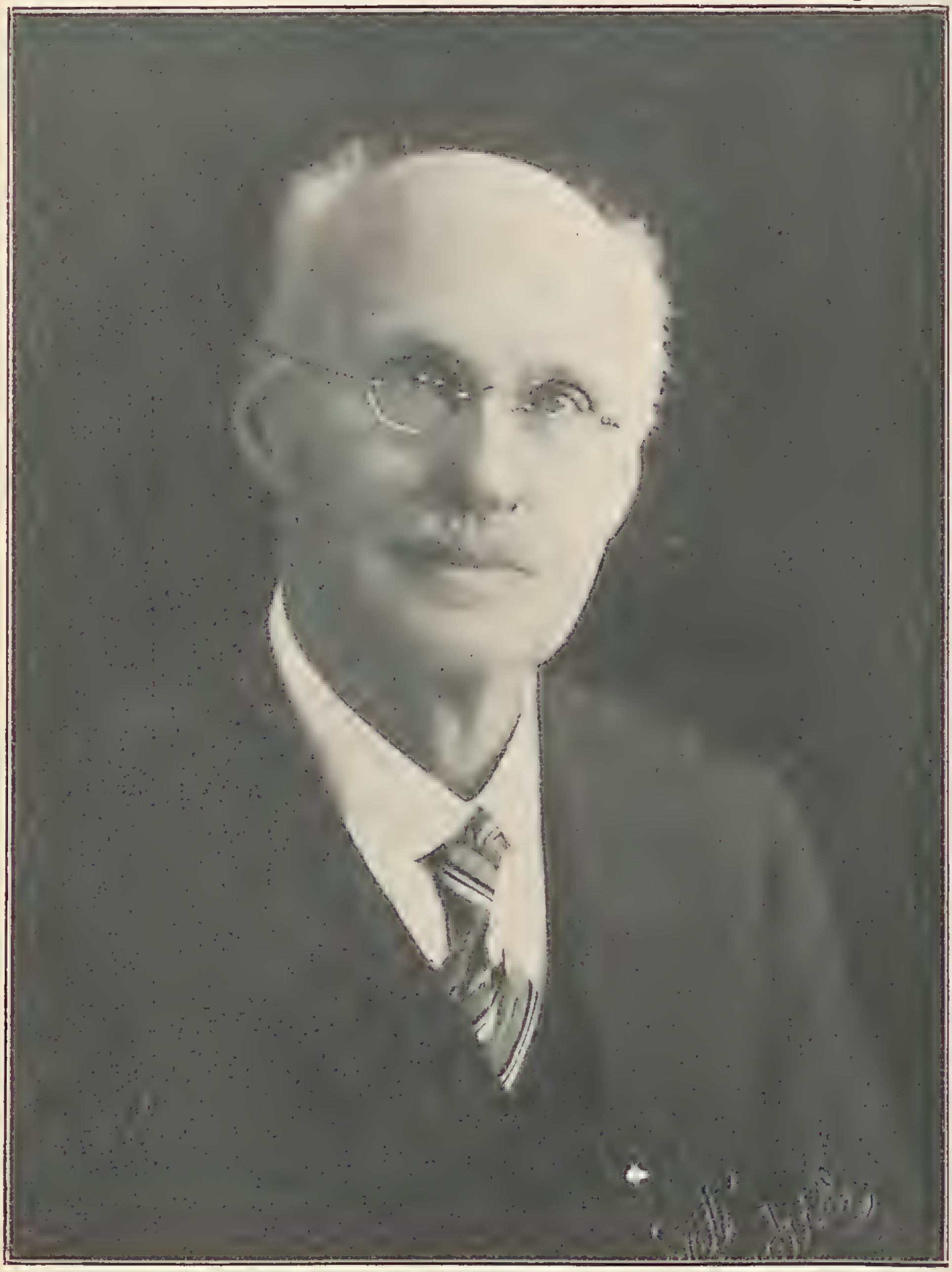

PLATE 17.—THE LATE J. C. BRÜNNICH, F.I.C., F.C.S., F.A.C.I.

of Agriculture and Stock, and served with the Department for thirty-five years. He had a notable record of valuable scientific achievement, both in Queensland and abroad, and his work in the interests of men on the land was of immense value.

He was born on 11th September, 1861, at Gorizia, in Austria, at which place his father was stationed as Lutheran minister. His early youth was spent in Bohemia, and then he was educated in Switzerland at a scholastic institution at which his father was lecturer in mathematics. He qualified by examination for admission to the Federal Polytechnic School at Zurich, where he studied chemistry under distinguished masters. On the completion of his studies in Zurich he travelled in Russia, and then for a period in Tiflis served with a firm of wholesale druggists, later to return to Bohemia to be a chemist in a sugar mill. During 1884 he did his turn of military service in Switzerland as a lieutenant of artillery, and it was while in the Swiss Army that he made the acquaintance of Dr. Muller, who, with his family, had just returned from Queensland, where he was one of the pioneers of the Gayndah district. Dr. Muller's information about this State induced Mr. Brünnich to seek his fortune here early in 1885, and soon after arrival he was appointed manager and sugar boiler at the malt refinery then in operation at Bulimba. In the following year he married Miss Kate Terry, a daughter of pioneers of early Brisbane. For ten years from 1897 Mr. Brünnich was the chief chemist and mill manager of the Colonial Sugar Refining Company's mill at Homebush, Mackay, where he did much special scientific investigation in both mill and field work. This carried him further into prominence, and in 1896 the late Mr. Peter McLean (first Under Secretary) and Professor Shelton, at the instruction of the late Mr. J. V. Chataway (Minister for Agriculture) visited Homebush and offered him the position of Agricultural Chemist. The Agricultural College at Gatton being established about that time, Mr. Brünnich, at his own suggestion, in the interests of economy, was appointed lecturer in chemistry at the college, in addition to Government Agricultural Chemist, which position he had previously accepted.

The late Mr. Brünnich was responsible for the plan on which sugar experiment stations were established, though in a somewhat modified form, and later did much valuable work in connection with inspection and reporting in the operations of central sugar mills, and in 1899 was a prominent participant in the Agricultural Conference held in Mackay, and later at other conferences elsewhere. He had been examiner in chemistry at the Pharmacy College; he had conducted inquiries into many matters bearing on tobacco soil and the culture of tobacco; he had investigated means for the destroying of prickly-pear; he had studied and investigated various natural grasses and pastures; and experimented with dipping fluids. He assisted in the drafting of many Bills bearing on fertilizers, margarine, stock foods, pure seeds, and the destruction of pests, and was a prolific contributor to the "Queensland Agricultural Journal." From time to time he was entrusted with the work of drafting plans for chemical laboratories, including the extensive one at the Department of Agriculture and Stock in Brisbane. He was technical adviser to the chairman of the first Royal Commission on the sugar industry in 1912; took a prominent part in fixing the analysis of payment for sugar-cane, and in 1914 prepared for Parliament a paper on the various methods of payment by analysis. His work in connection with malnutrition in animals is regarded as a notable achievement, as was that in respect of the introduction of suitable phosphatic licks. Comparatively early in his career in Queensland he became naturalised, and was appointed a Justice of the Peace. He joined the Queensland Mounted Infantry, and was in command of the Gatton squadron for a period, and in 1905 was elected a Fellow of the Institute of Chemistry of Great Britain and Ireland.

He is survived by his widow, two sons—Dr. K. F. C. Brünnich (Brisbane) and Mr. H. Brünnich (Agricultural Department)—three daughters—Mesdames S. E. Taylor (Goomeri), H. W. Horne (Brisbane), and Miss Pauline Brünnich (Brisbane)—also six grandchildren. At his interment at Toowong Cemetery on 4th July there was a large gathering of citizens representative of the Government Departments, the Queensland University, and professional, commercial, and industrial circles of the State. The Minister for Agriculture and Stock, Hon. Frank W. Bulcock, was represented by Mr. E. Graham (Under Secretary and Director of Marketing), and with him were many of Mr. Brünnich's former colleagues, including Mr. E. H. Gurney (Agricultural Chemist) and members of his staff.

Our sincere sympathy is extended to his bereaved relatives.

# The History of Economic Entomology in Australia.

By ROBERT VEITCH, B.Sc.Agr., B.Sc. For., F.E.S., Chief Entomologist.

ECONOMIC entomology now plays an important part in the activities of practically every Government agricultural service, hence it seems appropriate to give a brief account of the early steps taken to incorporate economic entomological research in the activities of the various State and Federal Departments in Australia. In addition to indicating where, how, and when official economic entomology had its beginnings in this country, the following paragraphs contain an account of the present organisation in the Queensland Department of Agriculture and Stock, and they also indicate some of the major results achieved.

## First Published Reference to Economic Entomology.

In going through the old files the writer found that the first definite reference to economic entomology in this country occurs in "The Proceedings of the Royal Society of Van Diemen's Land." The reference in question is a five-page article by Captain Berthan, entitled "On the Potato Grub of Tasmania." This article, which doubtless refers to the pest now commonly known as the potato tuber moth, was read before the society on the 14th March, 1855, and it is rather interesting to note that it contains three of the control measures generally incorporated in any advisory leaflet published on this pest in the year of grace 1933.

Although articles dealing with destructive insects and their control thus appear to have been published spasmodically at an early date in Australia's national history, many years were to elapse before official recognition was given to the necessity for economic entomological work. There was, however, a very distinct awakening in the late 'eighties and early 'nineties of last century.

## First Official Appointment.

To the State of Victoria must be given the credit for the appointment of the first official economic entomologist in this country, Mr. Charles French, senior, being appointed to that position in 1889. He held the appointment for many years, and will long be remembered by the publication of a profusely illustrated five volume work entitled "A Handbook of the Destructive Insects of Victoria," the first volume of which appeared in 1891, the final volume being printed in 1911.

## Other Early Official Appointments.

The mother State of New South Wales did not lag long behind Victoria, and in 1890 Mr. Olliff received a similar appointment in Sydney. One notable feature of his tenure of office was the fact that the Government of the day realised that entomological research in a large State was really more than a one-man job. Hence Mr. Olliff was given two assistants during his brief tenure of office, which was terminated by his untimely death in 1895. He was succeeded by Mr. W. W. Froggatt,

whose name will always be associated with the early investigation of the blowfly problem, and with the publication of the very fine text-book, "Australian Insects."

The first official entomological work in Tasmania commenced in 1891, when a Church of England clergyman, the Rev. E. H. Thompson, was appointed Entomologist and Pathologist to the Council of Agriculture.

In South Australia Mr. J. G. O. Tepper was appointed Consulting Entomologist to the Department of Agriculture in 1888, but this appointment was not on quite the same footing as those already mentioned. A few years later, in 1896, Mr. Claude Fuller was appointed to the staff of the Department of Agriculture in Western Australia. In the case of the Northern Territory, Mr. Gerald F. Hill held the position of Government Entomologist from 1912-1917.

The Queensland records show that Mr. Henry Tryon was appointed to the Department of Agriculture and Stock in 1893 with the official title of Entomologist.

Before discussing what has been achieved in Queensland, brief mention must be made of Federal activities in economic entomology. As far back as 1909 a Bill was introduced to the Federal House of Representatives, aiming at the establishment of an Australian Bureau of Agriculture. This Bill, however, never became an Act, and nothing further was done until the old Institute of Science and Industry was established. This Institute was subsequently expanded into the much more ambitious Council for Scientific and Industrial Research, which established an entomological division in 1927 under the control of Dr. R. J. Tillyard, to deal primarily with such national problems as blowfly, buffalo fly, and weed pest control.

## Early Developments in Queensland.

The remaining paragraphs of this article will be restricted to a discussion of the development of the work in Queensland. Referring once more to the records, the reader's attention is directed to the fact that in 1875 a board was appointed to inquire into diseases in live stock and plants. A sum of £2,500 was voted to the board during the years 1875 to 1877, and it issued four reports. No reason can be found for the disbanding of the board, but it is rather significant that the introductory paragraphs of the fourth, and, evidently, final report give a summary of the reasons for the continued existence of the board. This almost suggests propaganda in favour of a further grant of funds to replenish an exhausted treasury. If that was the case the propaganda was evidently unsuccessful, for no more is heard of the board after 1878.

In the second of the reports just mentioned there is a discussion of a serious sugar-cane pest occurring in the plantations on the Albert River on the South Coast. This article is from the pen of Dr. Joseph Bancroft, and to him must therefore be given the credit for having published one of the earliest articles on economic entomology in Queensland. Dr. Bancroft's name is, of course, one of the most honoured in scientific annals in this State, more particularly in medical science.

The immediately succeeding years are rather barren so far as further economic entomological work is concerned, but on reaching 1889 the appearance of a very comprehensive handbook may be noted. The

title of this publication is, "Report on Insect and Fungus Pests No. 1," and its 238 pages constitute a mine of information on economic entomology. This publication arose out of a visit of several months duration made by Mr. Henry Tryon to the Darling Downs, and it contains an exhaustive review of the information obtained by him during these months.

When an entomologist was added to the staff of the Department of Agriculture and Stock in 1893 Mr. Tryon was the obvious choice for the position, and he remained in charge of the general entomological work of the State until he was succeeded by the writer in 1925.

A very important aspect of Mr. Tryon's official career was his association with the bold experiment represented by the biological control of prickly-pear. He suggested such a possibility in 1899, and as a result of his interest in the subject he was chosen as one of the two members of the Prickly-pear Travelling Commission, which was appointed by the Queensland Government to visit the more important pear-infested countries during the years 1912 to 1914. As a result of their overseas investigations the members of the Commission, Mr. Tryon and Professor Harvey Johnston, recommended the introduction of various insect enemies of prickly-pear, including the now well-known species of Cactoblastis, colonies of which they actually brought back to Australia. These, however, did not produce a new generation of moths, and it was left to the subsequently constituted Commonwealth Prickly-pear Board to introduce and establish this most useful insect at a later date.

Like most departmental entomologists, Mr. Tryon worked single-handed for many years, but in 1908 an assistant was appointed and the staff of entomologists has since steadily expanded. There is now a headquarters staff and four field stations handling general entomology, in addition to three field stations under the control of the Bureau of Sugar Experiment Stations.

## Present Departmental Organisation.

The expansion of the staff has enabled the Department to devote an increasingly large amount of time to research work, and a wide range of problems is now being investigated.

The two main research projects at present handled by the headquarters staff are, firstly the field investigation of vegetable pests and their control, and secondly field experiments for the control of the dreaded thrips pest of bananas. Furthermore a large proportion of the time of the headquarters staff is devoted to the furtherance of field station research projects. The headquarters offices contain comprehensive reference collections, a large reference library, and various departmental records which are extensively drawn on for the better conduct of the investigations allocated to the various field stations. The publication of the necessary bulletins, pamphlets, and leaflets, and the illustration thereof, is also handled by the Brisbane staff.

The first field station was established at Stanthorpe in 1922, and during the intervening years many important and interesting problems have been investigated at that centre. Among the results achieved at Stanthorpe, mention might be made of the marked success which has followed the introduction of the Aphelinus parasite of the woolly apple aphis, the control of which pest is now a comparatively simple problem.

An excellent and very inexpensive lure has been evolved for the control of fruit fly, and this furnishes a further illustration of the benefits arising out of the establishment of the field station in question.

The second field station was established in North Queensland in 1928. The first centre of the work was at Cairns, but recently the staff was transferred to Atherton. At that centre the main investigations deal with the control of pests of tobacco, grasslands, maize, and timber. Among the successes to the credit of this field station, mention may be made of the evolution of satisfactory measures for the control of certain tobacco pests. Important practical results were also obtained in an investigation of a very serious borer problem associated with walnut bean logs exported for furniture veneers.

The third field station was established at Nambour in 1930. The main problems handled at that centre are citrus pests, but attention is also devoted to entomological problems associated with pineapples, strawberries, and other crops. During the few years that this station has been established, success has been achieved in evolving thoroughly satisfactory measures for the control of the two most serious pests of citrus—namely, the bronze orange bug and the larger horned citrus bug.

The fourth centre of entomological investigations is at Biloela, in the Callide Valley, where an officer has in recent years been stationed for the duration of the cotton season. The main work at that centre is the evolution of satisfactory measures for the control of the corn ear worm, which is such a destructive pest of cotton, tomatoes, maize, and lucerne.

The work of the Department is not confined to plant entomology, for in 1930 an entomologist was appointed to deal exclusively with stock pests. Following the recent reorganisation of the Animal Health Station at Yeerongpilly, that officer was transferred from Brisbane to the Yeerongpilly staff.

Only very general references have been made to the entomological activities in Queensland, but it is hoped that this brief survey has indicated to readers the manner in which the work began in Australia, and the lines along which it is at present being conducted in this State.

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# Squirter Disease of Bananas.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

SQUIRTER is the name adopted by the trade in the southern Australian States for a certain type of banana fruit rot which makes its appearance on the Sydney and Melbourne markets during the winter and spring months of the year. It was not until 1932 that the trouble was reported as occurring in Queensland, and then only as a rare appearance in cased fruit. Owing to the restriction of the disease to the Southern markets, the writer had had no opportunity of examining samples of affected fruit until 1932, when the manager of the Committee of Direction of Fruit Marketing, on request, kindly arranged for typical specimens to be returned from the Melbourne markets. It was then readily demonstrated, by the usual microscopic and cultural methods, that a distinct fungus was associated with the rot. This fungus when isolated and inoculated into sound bananas produced typical squirter symptoms. It was subsequently learnt that Dr. D. A. Herbert had obtained similar results a year earlier from material submitted to him at the Queensland University, and had placed the organism concerned in the genus *Nigrospora*. Since then a certain amount of work has been done regarding the source of infection, as well as attempting to explain the reason for the restricted seasonal occurrence. Although much remains to be accounted for, it is thought that the publication of the results obtained to date may help towards finding a solution of the trouble during the present winter season.

## Symptoms of the Disease.

The typical squirter banana is one in which the flesh of the fruit has decomposed to a dark, semi-fluid state, so that a squeeze of the hand will expel it in a stream from the stalk end or the side. On cutting a fruit before it has reached this stage there is seen a dark, watery rot extending out from the central placental region, and running varying distances longitudinally. The affected region is most commonly situated towards the stalk end, directly connected with a rotting of this region. (Plate 18.) In other cases there is apparently no connection with the stalk except for a few discoloured vascular strands. Again, the early stages of the rot may be situated well towards the flower end of the fruit.

It is characteristic of this rot that there may be no obvious external symptoms, and the fruit, if not felt, may be deemed quite sound. There is sometimes, however, a bluish black discolouration of the skin over the worst affected region which closely resembles in colour a bruise on the human flesh. This may be distinguished from the blackening of the over-ripe banana. The soft, black, decayed condition of the stalk, typical of fruit stalk rot, commonly accompanies the squirter condition, although it is not necessarily present. It is more than likely that the squirter organism should be included with the several other fungi responsible for this type of rot.

Examination of affected fruit indicates that, in the majority of cases at least, infection takes place by means of the broken fruit stalk. There is evidence that the fungus may travel some distance in advance of the obvious rot in association with the vascular elements of the centre


PLATE 18.

Natural squirter infections. A.—Fruit exhibiting sound external appearance and internal rot restricted to flower end. B.—Fruit showing a visible stalk rot with the internal decay extending from this end.

of the fruit. This may explain those cases where the lesion is separated from the stalk by a bridge of apparently sound tissue, the organism restricting itself to the placental region until a part more suited to rapid development is reached. On the other hand, in some few cases, infection through the apex or wounds may occur.

## Distribution and Economic Importance.

Squirter has been reported from all the main banana-growing districts of Southern Queensland, as far north as Gympie, and also from the Tweed districts of New South Wales. No one region appears to be subject to outstanding loss, though it may be pointed out here that King[1] stresses the fact that plantations, owing to their individual location from a temperature point of view, may be specially subject to the disease.

One consignment of bananas from Sarina were said to have shown squirter symptoms when ripened in Brisbane last year. There has, however, been some doubt expressed regarding the identity of the trouble with true squirter. Until confirmation of this report is obtained, North Queensland fruit may be regarded as being free from the disease.

Those districts which place their fruit mostly on the Brisbane market in the bunch form do not suffer to the same extent, as the disease is not definitely known to occur in fruit marketed in this way.

It is not possible to make a definite statement regarding the losses arising from squirter, although other writers have reported it as being serious during the months of its occurrence. Goddard[2] considers that £50,000 represents a modest estimate of the damage caused annually by squirter during the four years prior to 1929. One of the worst features is the depression of the market when this trouble makes its appearance. Figures collected by the Committee of Direction show that for 1928, apparently a typical year so far as squirter was concerned, the losses reported on the Melbourne market amounted to 1·7 per cent. of the total consignment, while in Sydney the corresponding loss was ·35 per cent. Judging from reports for other years also, it is evident that the loss in Sydney is insignificant compared with Melbourne.

Goddard records that all standards of fruit are affected, and that the percentage of damaged fruit in individual consignments varies from a few per cent. to practically the whole consignment, the latter, however, being by no means common.

## Previous Investigations.

A trouble to which the name squirter was applied was known as far back as 1920. Whether the same disease occurred under a different name prior to this date would be difficult to ascertain.

In 1925 the disease was sufficiently serious to suggest the need for investigation. The former Institute of Science and Industry and the Department of Agriculture and Stock, Queensland, agreed to contribute funds towards this end, and Professor E. J. Goddard, with Mr. H. Collard for Assistant, undertook the work.

Although a considerable amount was accomplished, no published record of this is available other than a short preliminary report by Goddard[2] in 1929. In this article the symptoms of the disease are described and the observation made that it is impossible to detect any signs of "squirter" potentialities in green bananas before their entry

to the ripening rooms. Special attention is called to the restriction of the disease to South Queensland, and the occurrence of the disease only during the winter months. The field experiments designed to ascertain conditions which might contribute to the development of the trouble are briefly outlined. He summarises his conclusions as follows:—"In the present state of our knowledge it would appear that fruit grown in certain parts—namely, in South Queensland—suffers during the winter period under a physiological disability which responds to unsuitable temperature or other conditions during transport in the development of the condition known as squirter."

Little further was attempted until Young, Bagster, Hicks, and Huelin undertook research into the ripening and transport of the Cavendish banana. In their report,[3] published in 1932, they include notes on several diseases encountered during ripening and transport—namely, black end, stem end rot, anthracnose, and squirter. They cite Goddard's opinion that squirter is a physiological condition developed in the plantation, and that the development of squirter in susceptible fruit is favoured by cold conditions after cutting. Bearing on this Bagster carried out an interesting experiment in which small cases of green bananas were stored for seven days at the temperatures: 65°, 59°, 53°, 48° F. and then ripened at 68° F., when the percentage of squirter developed was respectively nil, 15, 33, 37. This temperature effect was also brought out in another experiment, where fruit stored for four days at 50° F. before ripening developed more than three times the number of squirter bananas as did comparable fruit stored at 50° to 70° F. for the same period. The same authors note that squirter is apparently restricted to fruit from certain plantations. They also showed by experimental consignment that there is less tendency for squirter to develop in fruit packed in hands or part hands than when packed in "singles." They conclude by suggesting that squirter is due in part to some predisposing condition developed on the plantation, which may be accentuated by exposure to low temperatures after cutting, an opinion reminiscent of that expressed by Goddard.

About the same time as the above work appeared, King[1] published the results of a soil survey with reference to squirter occurrence, which he had undertaken at the suggestion of Professor Bagster. In this article King briefly reviews the position as it stood up to that time, mentioning the difficulty encountered in squirter control owing to the lack of knowledge regarding the primary cause of the disease. He refers to the non-occurrence of squirter in North Queensland bananas, even though they are railed in the same trucks as the southern fruit, and cites this as an argument against the cause lying either in (*a*) temperature conditions during transport, (*b*) packing methods, (*c*) ripening control.

King was unable to find any evidence to suggest that soil constituents, drainage, or the nature of the vegetation had any bearing on the incidence of squirter. His conclusions may be summarised in the following quotation:—

"The analytical data show definitely that squirter occurs on all types of soil from the poorest forest soil, which has grown bananas for twelve years without fertilization, to rich new scrub land in its first year of bunching. But one factor remains constant on all plantations—where a gully or hollow encroaches sufficiently far up the slope of the hill as to reach into the banana area, squirter is found to occur on that

plantation." He, therefore, concludes that "the fruit is primarily subjected to a cold spell on the plantation during the maturing period of the bunch, bringing about a cessation of certain physiological processes in the ripening of the fruit and rendering it subject to complete physiological breakdown in the event of further conditions such as obtain during transport." He further suggests that variations in temperature during transport, or contamination at this stage by an organism may accentuate the breakdown process, the ultimate condition being aided possibly by the ripening methods in the Southern capitals. Recent work has shown that his reference to a possible pathogen was justified.

The point in which all investigators appear agreed is that the development of squirter is definitely associated with cold, either on the plantation or during transport. As will be shown later, reference to the seasonal development of the disease also supports this conclusion.

### Evidence for the Parasitic Origin of Squirter.

A microscopic examination of the rotting tissue from a fruit showing squirter symptoms reveals the presence of a delicate thin-walled mycelium, densely packed with globules, measuring up to 6 $\mu$ in breadth. In the older lesions this mycelium is present in great abundance.

If an affected fruit is broken and allowed to incubate, there is developed upon the surface of the rotting tissue a dense, greyish mould growth associated with which the rounded jet black spores of the organism may be found.

Isolations from typical material to potato dextrose agar by the usual tissue-planting methods may be made very readily. These consistently yield the same organism, which is moreover commonly obtained from the lesion in pure culture. Inoculations of this organism into healthy fruit under suitable conditions will produce typical squirter symptoms, and from these lesions the fungus is easily reisolated. For this phase of the work the inoculations were made by means of a cut to either the stalk end or the side of the fruit. (Plate 21.)

As will be described later, spores morphologically identical with those belonging to the above organism have been found in association with banana material in the plantation and packing shed and also elsewhere. Isolations have been made from such material by both poured plate and single spore isolation methods. The resulting pure cultures may differ somewhat in character, but isolations identical with those obtained from squirter-affected fruit have been obtained. Certain of these cultures have been used to produce again the squirter type of rot on inoculation. (Plate 19.)

A scrape of naturally occurring spores from the plantation, when inserted by means of a cut into sound fruit, has also produced a typical rot, though of smaller dimensions. The squirter organism has been reisolated from these lesions and typical squirter symptoms obtained by reinoculation. Appropriate controls have been included in these experiments. (Plate 22.)

It, therefore, appears established that squirter of bananas is due to infection by a fungus having its origin in the plantation or its environs. Certain temperature or other meteorological factors are possibly associated with the full development of the rot to explain the influence of cold conditions so stressed by previous workers.

## The Causal Organism.

The fungus concerned in producing the squirter fruit rot is rapid in its growth and produces on potato dextrose agar a white cottony mycelium, which, as the culture ages, becomes darker in the substratal region from the centre outwards. When a plate culture is placed media-side up mycelial wefts will grow down in a columnal structure to reach the lid. In some strains spore formation takes place readily, whereas in others it occurs rarely if at all. The spores and their method of formation are very characteristic, and place the organism in the genus *Nigrospora.* Mason[4] refers to the genus as follows:—"This is held to be sufficiently characterised by its jet black, shiny, depressed-globose aleuriospores and its characteristic ampulliform aleuriophores."

Species of this genus have been recorded from the banana on more than one occasion from other parts of the world. Mason[5] records the isolation of *N. sphærica* from the fruit and petioles of West Indian banana plants, and the occurrence of *N. oryzæ* on banana leaves from Jamaica. Tomkins[6] lists *N. oryzæ* as one of the fungi commonly occurring in association with a fruit stalk rot in West Indian bananas during shipment to England.

Mason,[5] when reviewing the genus in 1927, recognised three distinct species based on spore size alone. In his later note[4] he states that the problem of determination is still in an unsatisfactory position as no further morphological characters distinguishing the species have been noted. In Table I., Mason's measurements from various hosts for these three species are given after being summarised and reduced to a percentage basis. Measurements of *Nigrospora* spores obtained from various sources in Queensland are also shown. Mason has been followed in recording only the long diameter of the spores and in the method of presentation.

It will be seen that, of those examined, the majority of isolations from naturally infected bananas yield an organism which as regards spore dimensions falls clearly in the *N. sphærica* group. Two other isolations from different fruit of the same consignments have a somewhat lower range, but since their cultural characters are identical with the rest, their affinities evidently lie with the same species.

To confirm this diagnosis cultures were submitted to the Imperial Mycological Institute, Kew. Mr. S. F. Ashby identified the fungus as *Nigrospora sphærica* (Sacc.) Mason.

## Some Sources of Nigrospora.

*Nigrospora sphærica* has been recorded according to Mason on maize, rice, sugar-cane, coconut, and *Arundo conspicua,* and his records are from three continents. It, therefore, appears to be a very cosmopolitan organism, a conclusion which is borne out by experience in Queensland.

The characteristic nature of the *Nigrospora* spore has made possible a survey of a number of plantations and their environs by microscopic methods with a view to ascertaining the source from which infection might arise.

The packing-shed was made the starting-off point, and the examination made on material collected in November, 1932, showed a *Nigrospora* with typical spore dimensions to be present in four out of five plantations visited, associated with bunch stalks and other banana refuse lying near the sheds. Later work indicated that the organism

**Table I.—Spore Measurements of Nigrospora spp. from various sources including an adaptation of Mason's Series.**

| Host Association. | Origin of Spore Material. | No. of Spores Examined. | 10μ | 11μ | 12μ | 13μ | 14μ | 15μ | 16μ | 17μ | 18μ | 19μ | 20μ | 21μ | 22μ | 23μ | 24μ | 25μ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Banana— | | | | | | | | | | | | | | | | | | |
| Natural squirter infections .. | 6 isolations on P.D.A. .. | 120 | .. | .. | .. | .. | 1 | 14 | 35 | 19 | 36 | 6 | 5 | 1 | .. | .. | .. | .. |
| Ditto .. .. .. | 2 further isolations .. .. | 40 | .. | .. | 3 | 5 | 9 | 9 | 8 | 3 | 3 | .. | .. | .. | .. | .. | .. | .. |
| White leaf lesions .. .. | 4 collections from plantation.. | 80 | .. | .. | .. | .. | .. | 7 | 8 | 10 | 29 | 12 | 8 | 1 | 2 | .. | .. | .. |
| Ditto .. .. .. | 1 further collection .. .. | 40 | .. | .. | .. | 5 | 7 | 18 | 7 | 2 | 1 | .. | .. | .. | .. | .. | .. | .. |
| Bunch Stalks .. .. .. | 3 collections packing dumps .. | 60 | .. | .. | .. | .. | .. | .. | 4 | 8 | 25 | 17 | 5 | 1 | .. | .. | .. | .. |
| Bunch spathe .. .. .. | 1 collection .. .. .. | 50 | .. | .. | .. | 2 | 1 | 4 | 6 | 3 | 6 | 8 | 14 | 4 | 2 | .. | .. | .. |
| Petiole .. .. .. .. | 3 collections plantation trash | 70 | .. | .. | .. | .. | .. | .. | .. | 2 | 11 | 2 | 7 | 17 | 12 | 8 | 9 | 2 |
| Petiole and white leaf lesions.. | 3 single spore cultures on P.D.A. | 90 | .. | .. | 3 | 18 | 19 | 35 | 5 | 5 | 4 | 1 | .. | .. | .. | .. | .. | .. |
| Couch (*Digitaria didactyla*).. .. | Culture on P.D.A. .. .. .. | 50 | .. | .. | 1 | .. | 1 | 1 | 6 | .. | 16 | 11 | 6 | 5 | 2 | 1 | .. | .. |
| Kikuyu (*Pennisetum clandestinum*) | Field material .. .. .. | 50 | .. | .. | .. | .. | 2 | .. | 3 | 6 | 13 | 11 | 6 | 8 | .. | 1 | .. | .. |
| Rhodes grass (*Chloris gayana*) .. | ditto .. .. .. .. | 50 | .. | .. | .. | .. | 2 | 5 | 13 | 10 | 10 | 1 | 4 | 3 | 1 | 1 | .. | .. |
| Sorghum (*Sorghum vulgare*) .. <br> Johnson grass (*Sorghum halepense*) | } ditto .. .. .. .. | 60 | .. | .. | .. | 1 | 1 | 2 | 23 | 15 | 16 | 2 | .. | .. | .. | .. | .. | .. |
| Paspalum (*Paspalum dilatatum*) .. | Field material (2 collections) .. | 50 | .. | .. | .. | .. | 5 | 17 | 17 | 6 | 9 | 3 | 1 | 1 | 1 | .. | .. | .. |
| Natal grass (*Rhynchelytrum roseum*) | ditto .. .. .. .. | 50 | .. | .. | 1 | 8 | 7 | 20 | 10 | 9 | 5 | 1 | .. | .. | .. | .. | .. | .. |
| Blady grass (*Imperator cylindrica* var. *koenigii*) | Field material .. .. .. | 50 | .. | .. | 2 | 4 | 5 | 20 | 5 | 2 | 2 | 7 | 2 | .. | .. | .. | .. | 1 |
| Various (Mason: Trans. Brit. Mycol. Soc., XII., 2-3, pp. 152-165) | Mason's measurements for *N. Sphærica* reduced to a percentage basis | 425 | .. | .. | ·2 | ·7 | 3·5 | 5 | 21 | 23 | 34 | 8 | 4 | ·2 | ·2 | .. | .. | .. |
| Ditto .. .. .. .. | The same for *N. oryzae* .. .. | 487 | ·2 | 1 | 6 | 24 | 43 | 19 | 6 | .. | ·2 | .. | .. | .. | .. | .. | .. | .. |
| Sugar cane (Mason: Ibid.) ., | Type material of *N. sacchari* after Mason | 50 | .. | .. | .. | .. | .. | .. | 1 | .. | 4 | 9 | 13 | 11 | 6 | 3 | 3 | .. |

was commonly present in this situation, and even more prevalent in the plantation itself, where it occurs on the dead trash lying on the ground or hanging round the pseudostem and elsewhere. One point of occurrence is on the petiole of the dead leaf near its junction with the pseudostem and another on the main subtending spathe of the bunch which remains hanging in the dead state over the latter. The organism is also found fairly consistently on a type of leaf lesion which appears to have its origin for the most part in a form of sun scald. These consist of large light-grey papery areas, up to several inches in diameter, sharply delimited from the green leaf by a narrow brown border.

Spore measurements of some of the material examined are given in Table I. Those from three collections of bunch stalks and the same number of white leaf lesions are of the typical *N. sphærica* type. One series from a leaf lesion resembles the smaller spored form of the original isolations.

Strangely, three collections from leaf bases provided spores of considerably larger dimensions and agreeing more closely with those of *N. sacchari* (Speg.) Mason. An isolation from this material was typical of the squirter organism.

The collection from a bunch spathe, while coming within the *N. sacchari* group so far as its mean is concerned, has a somewhat intermediate position between that of the petiole collection and the typical *N. sphærica*. From the spathe material no difficulty was experienced in isolating the typical squirter strain of *Nigrospora*. This suggests the possible necessity of extending the *N. sphærica* group to include that of *N. sacchari* also.

It will thus be seen that the plantation affords an important source of squirter infection. An interesting experimental confirmation of this was obtained on a plantation which had had recent losses from the disease. Examination of the fruit in the packing-shed showed that *Nigrospora* spores were present on the surface of the skin in a number of instances. A few fruit retained from this shed later developed a somewhat atypical squirter decay from which the typical organism was isolated. The same condition with respect to spore contamination held in the plantation itself, where fruit were taken at random from the upper part of various bunches. Spores were found to a certain extent on leaf bases, bunch bracts, and white leaf lesions in the same plantation.

In one case in particular a white leaf lesion on which was developed an abundance of *Nigrospora* spores directly overhung a fairly mature bunch. When examined, the fruit of this bunch was found to be plentifully scattered with the same spores. The number present on the fruit may be judged from the fact that from a piece of skin approximately 2 x 1 cm. no difficulty was obtained in securing twelve spores for single spore isolation. Of a total of twenty-three spores successfully transferred from the fruit picked in the plantation to banana infusion agar plates, thirteen germinated in the typical manner, and from these, cultures were obtained indistinguishable from those of original squirter fruit isolations. The mycelium of single spore cultures obtained from these fruit and white leaf lesions and also spores scraped direct from the latter were used to inoculate healthy fruit, and a rot of the squirter type resulted. The organism could be reisolated from these lesions.

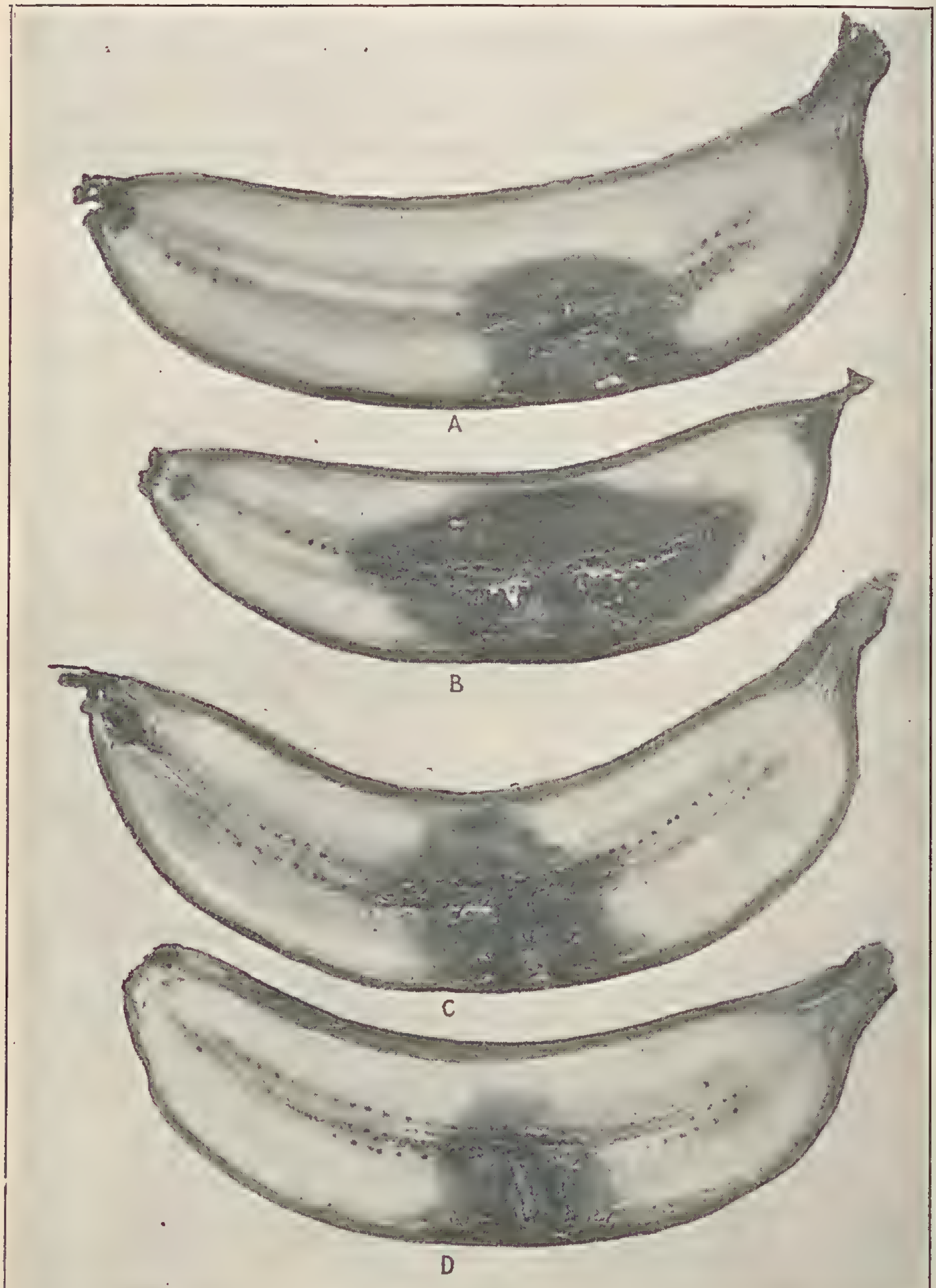


Plate 19.

Results of inoculation with *N. sphærica* cultures obtained from the following sources:—A and B.—Isolations from fruit inoculated with spores obtained from Natal grass and sorghum respectively. C and D.—Single spore isolations from Johnson and Natal grass respectively. A and D.—Compact type of mycelium. B and C.—Straggly.

Similar results were obtained with fruit from another plantation, except that in this case the source of supply of spores was found to be the dry bunch bract hanging over the fruit. Spore isolations from both this bract and the surface of the green fruit yielded the typical squirter organism.

Besides the banana a number of other plants are capable of forming a suitable substratum for the development of *Nigrospora*. Spores may be formed on the dead portions of blue couch (*Digitaria didactyla*), Kikuyu (*Pennisetum clandestinum*), Rhodes grass (*Chloris gayana*), sorghum (*Sorghum vulgare*), Johnson grass (*Sorghum halepense*), paspalum (*Paspalum dilatatum*), Natal (*Rhynchelytrum roseum*), and blady grass (*Imperata cylindrica* var. *koenigii*). According to spore measurements the fungus as it occurs on the first five of these hosts belongs to the *N. sphærica* group. Those from the last three show spore dimensions somewhat smaller, and in this they resemble the two strains from original squirter isolations listed at the beginning of the table. Fruit inoculated with cultures and spores obtained from some of these plants have developed a typical rot from which the *Nigrospora* may be isolated. (Plate 19.)

At the present stage of the work the writer is not prepared to state how many species of *Nigrospora* occur in Queensland. Mason himself seems to doubt whether the division on morphological grounds alone is justifiable. Although some of the Queensland material exhibits a lower mean than his, it is probably referable to the *N. sphærica* group rather than to *N. oryzæ* (B. and Br.) Petch. A group of single spore isolations included in Table I. show morphological relationships with the latter species. Since these are decidedly atypical in cultural characters, and as the characters of a *Nigrospora* are said by Mason to vary towards the smaller species in some instances under cultural conditions, no great attention has been paid to the occurrence. Reference has already been made to the question of whether the group included in *N. sacchari* (Speg.) Mason, represents a distinct species.

It is generally considered inadvisable to create a complexity of species unless the grounds for so doing are clearly justified. It may therefore be best, for the present at least, to regard all the forms of *Nigrospora* so far found in association with Monocotyledons in Queensland as belonging to the group included within the species represented by *N. sphærica* (Sacc.) Mason. From the discussion on cultural characters which follows it is evident, however, that there exists a distinct strain, marked by certain cultural features and its greater pathogenicity towards the banana fruit, which is probably responsible for most of the squirter trouble occurring in Queensland.

The important point to consider is where the main source of infection originates. Observations on plantation conditions such as those just described suggest that in most cases the fruit is contaminated with spores before the bunch is cut. Subsequent infection is made possible by means of the tears and bruises occurring during packing operations. This probably constitutes the main source of trouble. A subsidiary source of infection lies in spores present in the packing shed and on banana refuse in the vicinity. It is doubtful whether the organism as present on various grasses and cereals, even when of the proved pathogenic strain described below, plays any significant part in squirter development, unless this material is used as bedding for the fruit either in the plantation or packing shed.

## Cultural Characters.

Over eighty strains of *Nigrospora* isolated by single spore, poured plate or tissue planting methods from the banana and six other hosts have been compared with respect to their cultural characters on potato dextrose agar. The situation has been found too complex to make any final statement at this stage, owing to the variation exhibited even by cultures obtained from the same field material. For practicable purposes it has been found possible to establish two groups based on the characters exhibited during the first forty-eight hours after subbing to a potato dextrose agar plate.

The first and probably the most important group is characterised by a rapid, open type of growth restricted to the surface of the agar and developing little or no aerial growth for the first forty-eight hours at least, although any deficiency in this respect may be made up by the rapid growth of a white, cottony mycelium later. The edge of the colony is made characteristic by the presence of stout hyphæ, which are clearly defined from the finer laterals and extend out in an irregular, straggly, and usually curved manner from the main body. This group includes all the isolations made from typical squirter bananas, as well as isolations from banana leaf, bunch spathe, petiole, and fruit surface, sorghum, Johnson and Kikuyu grasses.

Group 2 includes strains with a less open type of growth usually producing a fine but distinct aerial mycelium even in the early stages. The margin of the colony is more even, the hyphæ being finer and of a more regular radiating type, with the coarser straggling hyphæ characteristic of Group 1 inconspicuous or absent. However, in some border line cases it is difficult to determine to which group a particular strain should belong. The growth of members of this group is usually less rapid, and individuals may display considerable differences in the final appearance of the aerial mycelium, and in substratal colouration. Strains falling within this group have been obtained from banana leaf, petiole, and fruit surface as in the case of Group 1, and also from couch, paspalum, and Natal grass.

In addition to these there are a few forms distinct from those already described, differing considerably amongst themselves as regards rate of growth, which is usually slow, density, abundance of aerial mycelium, &c. Except for the fact that their development has been observed from a single spore, they would scarcely be considered to belong to a *Nigrospora*. Little attention has been paid to these forms.

It has been noted that all isolations from naturally occurring squirter infections are of the straggly type described in Group 1. Although definite lesions have been obtained when cultures of the non-straggly appearance are inoculated into green fruit, evidence has been obtained which suggests that it is the strains of the former type which are most actively pathogenic and are instrumental in causing the squirter disease. For example, three fruits were inoculated with a culture of the straggly type obtained from spores on a banana petiole. Three similar fruit were inoculated under identical conditions with a culture of the non-straggly type obtained from the same source. After eleven days the average extent of rot in the two cases was as follows (Plate 22):—

| | |
|---|---|
| Fruit inoculated with straggly type .. .. | 9·0 cm. |
| Fruit inoculated with non-straggly type .. .. | 3·3 cm. |

Somewhat similar results have been obtained when inoculations have been made with the two types but from different sources. The more

rapid growth of the straggly form may contribute to its success as a pathogen. At optimum temperatures the rate of lateral growth may be double that of the more compact strains.

It is of some interest to note that the straggly type appeared in considerably greater proportions in material collected subsequently to a recent spell of exceptionally cold weather. Whether the reason for this lies in the location of the collection or in a temperature factor is yet to be determined.

Spore germination is characteristic, and might be mentioned here. Normally there are two germ tubes produced from opposite poles. These branch sparingly and at first the hyphæ grow with somewhat aimless meanderings distinct from the more usual radiating type. The mycelium is also somewhat characteristically waved rather than straight. The tendency to depart from the radial path is maintained even later, and a definite clockwise rotation is often discernible.

### The Relationship of Temperature to Squirter Development.

The work of previous investigators has emphasised the fact that low temperature, either on the plantation or during transport, has a definite bearing on the development of squirter. An attempt has been made to find an explanation for this, but up to the present one based on definite evidence has not been forthcoming.

The Committee of Direction of Fruit Marketing has kindly made available the reports of their agents in Sydney and Melbourne on the amount of squirter developing at different periods throughout the years 1928 to 1933. The incidence of squirter for selected years has been compared graphically with the maximum and minimum temperatures Brisbane (for South-Eastern Queensland), relative humidity Brisbane, and average temperature Melbourne. Arising out of this are two points which may be of some significance.

Firstly, the earliest record in the year and also some of the more serious subsequent outbreaks frequently follow closely on a sudden drop in minimum field temperature to between 40° and 45° F. In 1928 and 1930 heavy loss followed a period of about a fortnight, during which the temperature frequently fell to within this range.

Secondly, the average temperature in Melbourne during the period of the year in which squirter occurs is for the most part well below 60° F.

The earliest date on which squirter has been reported is from fruit leaving Queensland on 28th April, and the latest 24th November of the same year, 1928. Both of these records are of Melbourne occurrence. Usually the disease does not appear in a severe form until towards the end of June, the middle of winter, though it may continue well into the warmer spring months. It will be remembered that losses in Sydney are less than in the cooler Southern capital.

If a fungus is responsible for squirter, one might expect on the above evidence to find that this organism had a specially low temperature range. Judging from the results so far obtained this is not so. The temperature reactions for a number of strains are incorporated in Plate 20. A multiple temperature incubator providing temperature ranges differing by approximately 2° C. was available for this work.

The growth-temperature curve averaged for seven strains all from original squirter isolations is shown in A. The curve for the strain with the lowest optimum out of this series is given by B, and that with the highest optimum by C.

It will be seen that the optimum ranges from 22° C. (72° F.) to 25° C. (77° F.). Seventy-five per cent. of the maximum, which may be taken as a normal rate of growth, is possible between 18° C. (64° F.) and 26·5° C. (80° F.). Little development takes place below 10° C. (50° F.) on the lower side, and growth ceases altogether at about 33° C. (91° F.) on the upper.

The temperature of spore germination is important from the point of view of infection. The germination of spores from field material, and to a less extent those in culture, is somewhat erratic. The reason for this has not been investigated. The most satisfactory medium so far used consists of tap water in which pieces of shredded banana leaf have stood for a short time. When conditions have been suitable satisfactory germination has been obtained over the whole temperature range at which active mycelial development is possible. For example, one actively sporing strain from an original squirter isolation gave a germination of 90 per cent. and over between 14·5° and 27° C.

Temperatures favouring spore production were noted with respect to four strains on potato dextrose agar plates incubated at thirteen different temperatures from 7° to 34° C. Spores were formed between 15° and 26° C. (59° and 79° F.) in all cases, the exact optimum varying for the strain concerned. Outside these limits production diminishes more or less rapidly and ceases altogether for some strains.

An attempt was made to ascertain whether rotting of the fruit followed the same temperature relationships as did the vegetative growth

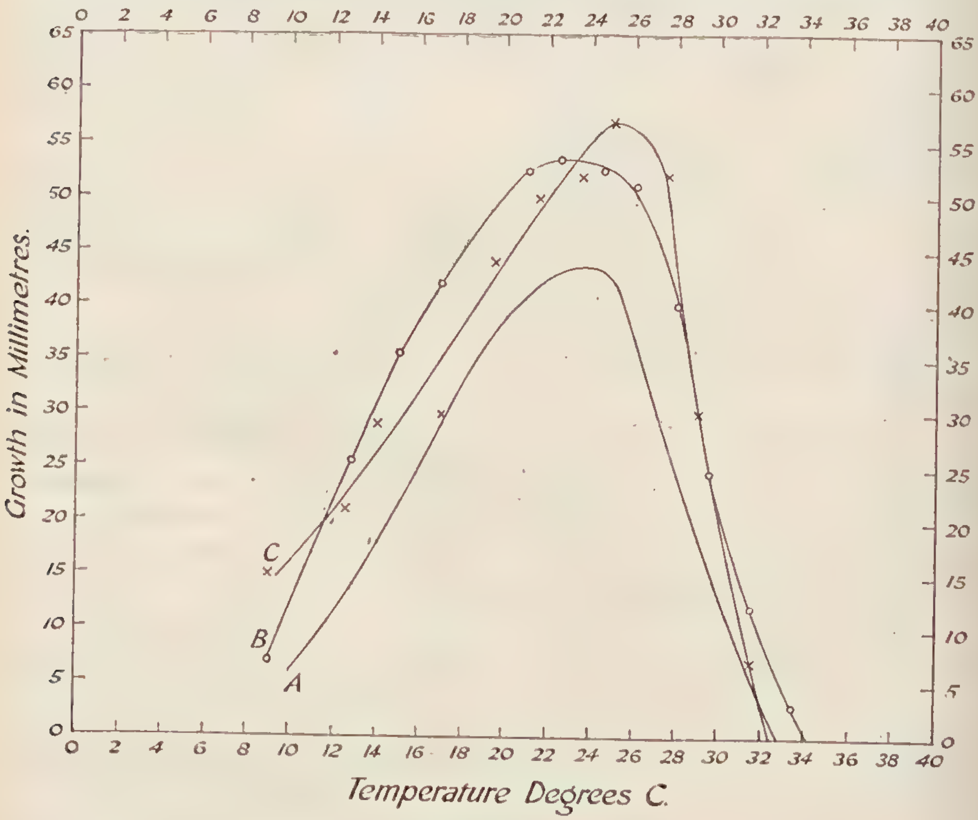


Plate 20.

Growth-temperature curves for *N. sphærica* strains isolated from original squirter infections. A.—Average of 7 strains. B and C.—The curve for the strain having the lowest and the highest optimum respectively. All on potato dextrose agar; 26 hours' growth in the case of B and 23 in the case of C.

of the fungus. Only preliminary results are available in this connection, but it appears that the maximum amount of rotting takes place at a temperature a few degrees lower than the optimum for fungus growth. Apparently the reason for this is that at the higher temperature the pulp softens too rapidly for it to provide a suitable medium for growth of the organism. The typical squirter rot is not produced in the hard green or soft ripe fruits, but in the intermediate stages.

When consideration is given to the various temperature relationships discussed above, it is difficult to accept the view that the cold conditions so often associated with squirter development act directly as a stimulus to either spore germination or vegetative growth of the organism concerned. For example 50° F. (10° C.), at which point Bagster obtained such marked infection figures, is well below the optimum for the vegetative processes of any of the strains so far studied. A general seasonal influence is, of course, to be expected, since the temperatures during the summer months in Queensland are such as would be expected to check the growth of an organism with requirements such as the one under consideration.

One is therefore forced to the conclusion that if a temperature factor is present it must act in regard to the fruit itself. Two suggestions are tentatively put forward for the operation of this factor. Young[3], Bagster, Hicks, and Huelin point out that there is some fundamental physiological difference in banana fruit in the winter and summer seasons. Also, ripening at temperatures below 66° F. is slower, and the product usually varies from the normal as regards flavour and texture. It is possible that chilling may provide a fruit of a composition more suited to the rapid development of the fungus within its tissue. So far it has not been possible to obtain confirmation of this experimentally.

Another effect of cold conditions is the delayed ripening period. Winter fruit may take from two to four days longer to ripen than in summer, depending on the amount of chilling to which they have been subject. This may prolong the stage in the ripening of the fruit at which rotting makes most rapid progress, with the result that squirter appears to a greater extent. Fruit is also held for longer periods before retailing in the winter months. Wardlaw and McGuire[7] record the greater development of main stalk rot in West Indian bananas owing to a delayed ripening after chilling.

That the method of ripening definitely affects squirter development is shown by the following experiment:—

Eighteen fruits from the same bunch were inoculated in the hard green (unsprung) stage with a pathogenic strain of *Nigrospora* having an optimum growth in culture at 75° F. Two days later half were placed in the Committee of Direction rooms and ripened under standard conditions at 66° to 69° F. The other half were allowed to ripen without gas in a laboratory temperature of 61° to 70° F., the first six days being at the lower temperatures. It is understood that the Committee's method would accelerate the early stages and retard the later stages of ripening. After eleven days both samples were approximately of equal ripeness and were examined. The Committee of Direction ripened fruit averaged 2·6 cm. of rot, while those ripened in the laboratory averaged 6·4 cm. Plate 21 illustrates this result.

The typical squirter does not develop to any extent while the fruit is in the hard green (unsprung) or the soft ripe condition, but in the intermediate stages. After inoculating green fruit with mycelium,

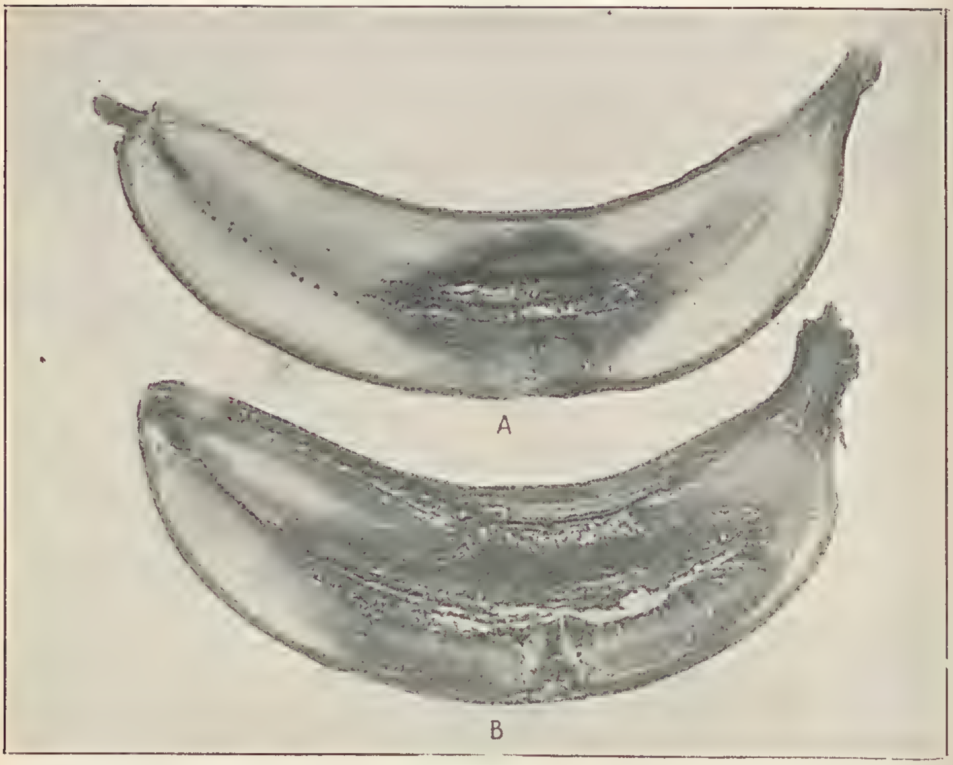


Plate 21.

The influence of ripening on squirter development. A.—Ripened in regulated rooms. B.—Ripened in laboratory without gas. The greatest development in each series represented. Inoculated with culture from an original squirter infection

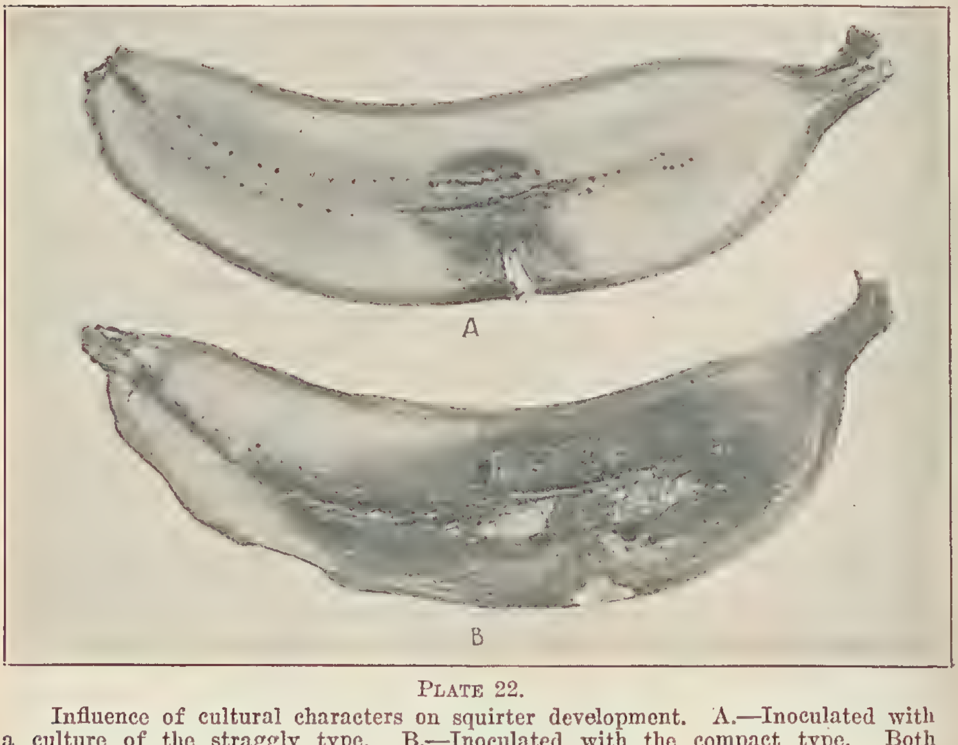


Plate 22.

Influence of cultural characters on squirter development. A.—Inoculated with a culture of the straggly type. B.—Inoculated with the compact type. Both cultures originally isolated from the same banana petiole. The average fruit from a series of three in each case.

several days may elapse before any appreciable lesion is observed, and for extensive rotting to take place ten to twelve days or more may be necessary.

In an attempt to ascertain what main constituent of the fruit fungal growth depended on, four strains of *Nigrospora* were grown on three synthetic media of which the carbohydrate constituent was composed respectively of 10 per cent. starch, 10 per cent. glucose, and 10 per cent. starch plus 2 per cent. glucose. Mycelial growth was most abundant on the glucose media, with the glucose plus starch only slightly less.

When discussing cultural characteristics it was mentioned that the strongly pathogenic straggly form of the *Nigrospora* was obtained from field material much more consistently after the marked cool spell occurring during the latter part of last June. This opens up the possibility of a temperature factor operating in the production of a more pathogenic strain of the organism. It is hoped to obtain more definite evidence on this point.

## Control.

The finding of an organism responsible for squirter has resulted in bringing a different point of view to bear on the question of the control of the disease. It may be, however, that the physiological side will still need to receive attention.

Three aspects of squirter control come up for consideration:—Sanitation measures to reduce the source of contamination, treatment of the fruit to prevent infection, and the adjustment of the physiological processes of the banana so as to render it less subject to invasion. These aspects will be dealt with in the order mentioned. It is realised that some of the precautions advocated will entail extra work which will be justified only when losses from squirter are considerable.

### Sanitation.

Since a *Nigrospora* capable of producing a rot of the banana fruit is known to occur in so many situations, an attempt to exclude all sources of inoculum becomes fraught with difficulties. It is not at present known whether all strains of *Nigrospora* possessing morphological characteristics identical with *N. sphærica* are capable of producing the typical squirter disease. It may be that as a result of further work the situation will become clearer. As has been mentioned earlier, for all practical purposes the plantation and, to a lesser extent, the packing shed, may be regarded as the main danger points in so far as they probably provide the source of most of the infection.

(1) In the plantation dead leaves should be removed by cutting them well back to the pseudostem. The narrow spathe which remains attached to the top of the bunch stalk should be cut off before it dries. The removal of leaves showing the early stages of the white leaf spot might be possible in some cases.

(2) The packing shed and its environs should be kept free of all banana refuse. If possible a wooden floor and packing bench should be provided to make sanitation easier. The shed should be sprayed out periodically with a formalin solution of 5 per cent. strength. Waste fruit and bunch stalks should be collected systematically and buried or burnt.

(3) Neither grass nor banana trash should be used for standing fruit upon. Rank grass should be burnt off in the immediate vicinity of the packing shed and plantation.

### PROTECTION OF THE FRUIT FROM INFECTION.

As has been pointed out, the fruit in many cases enters the packing shed with spores of the fungus already upon it. The precautions suggested above can be expected to reduce the amount of spore material available for infection but not to eliminate it entirely. In this respect squirter differs from another transport disease—soft rot of pineapples (*Thielaviopsis paradoxa*)—since, in the case of the latter disease, packing-house sanitation is all important and field infection usually negligible.

The procedure adopted by many growers of stacking all their fruit from any one cut on the floor of the shed or the bench prior to packing makes some form of fungicidal treatment at this stage practicable. Two methods of treatment might prove useful in this connection. The fruit as it is received from the plantation could be either sprayed with a suitable wet spray, such as a weak solution of formalin, or be fumigated under a tarpaulin with gaseous formaldehyde liberated by the potassium permanganate method. Experiments directed towards finding the most suitable method for treating fruit at this stage are now in progress, and it is hoped that definite information will be available at an early date.

When describing the symptoms of squirter it was pointed out that infection appeared to take place in the great majority of cases through the broken stalk end. Bagster[3] is responsible for an experiment having an important bearing on this point. Comparable cases of fruit were packed in "hands," "fours," and "singles," and each subjected to three methods of ripening. It was found that the amount of squirter developing in the "hand" pack was insignificant as compared with the "single," while the "four" pack was somewhat intermediate between the two. This result is as would be expected on the above assumption of fruit stalk infection, since the collar left on the hand when it is removed from the bunch would form an effective barrier to fungus invasion. Moreover, the bruising and tearing of the fruit stalks, which occurs when hands are divided into "singles," is entirely obviated.

It is recognised that there is some opposition in the trade towards fruit packed in this way on account of the smaller count of fruit to the case. However, if concerted action is brought to bear, a system of equitable payment should be forthcoming, especially when dealing through the growers' own organisation.

(4) Growers whose fruit is subject to squirter, black end, or other affection of the fruit stalk should pack in "hands" or "part hands" rather than "singles." This is probably the most practical and important point with respect to squirter control.

(5) Care must be exercised during all stages of handling the fruit to avoid bruises and wounds. Bending the fruit on its stalk will not cause any appreciable damage at the time, but a black bruised area is almost certain to develop later where the tissues have been crushed, and this is a common point of entry of fungal organisms.

### REDUCING THE EFFECT OF COLD.

To protect the fruit from the cold while still in the plantation, a system of bagging or cloaking the fruit may prove to be of considerable help. In the winter time the loss of leaf caused by the combined effects of cold weather and the presence of leaf spot and speckle disease results

in the exposure of the fruit to the sun during the day and cold at night. It has been found that by covering the bunch with a hessian bag the fruit is enabled to mature normally and fill out more satisfactorily. A number of growers are making this a routine practice during the winter months. Two methods are available. The bunch may be entirely enclosed in a sack of suitable size and texture. In its ultimate effect this practice is most commendable, but two objections arise in that the operation takes time, and observation of the correct cutting maturity is made more difficult. For these reasons the method of cloaking has some advantage. In this case half a sack is used. This may be rapidly thrown over the exposed side of the bunch, and secured behind by a nail to act as a pin. Covering should take place when the fruit are commencing to fill out, the correct time being largely a matter of experience.

(6) When taking up land for banana growing an effort should be made to secure a site in a warm locality and with a suitable aspect in order to avoid chilling during the winter.

(7) Bunches should be covered by bagging during the winter months. Fruit should not be left in exposed situations during cold weather. It should be picked when warm and despatched with as little delay as possible. The cases should be well lined with paper as recommended for winter conditions.

(8) Fruit subject to squirter should be ripened as quickly as possible by modern methods, and should not be held in the green or partly ripened condition.

Improvements have been made of late years in rail transport conditions, with the result that chilling is not likely to occur at this stage.

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# HARVESTING AND PACKING OF PINEAPPLES.

By C. G. WILLIAMS, Acting Instructor in Fruit Packing.

IN the marketing of pineapples for both factory and the fresh fruit trade, it is essential that correct methods be applied in selecting mature fruit. Growers are required to accept guidance in this matter by observing the maturity standards as prescribed in the regulations under "*The Fruit and Vegetables Act of* 1927," which read:—

> "In the case of pineapples, fully developed fruit which during the months November to March show a distinct tinge of yellow colour at the base, and during the months April to October is quarter yellow coloured at the base."

It may be found that sugar content is sometimes in advance of colour, or the reverse may apply. However, if the conditions mentioned in the maturity regulations are followed, sugar contents will usually be found sufficient.

A further guide in determining maturity will be found in the leaflets at the base of the eyes on the fruit. When these leaflets are quite dry and the pips full, the pineapple is mature.

## Harvesting.

Breaking the fruit from the stem is bad practice on account of the greater opportunity presented in the roughened surface for the entry of decay at the stem end. The fruit should be cut from the plant with a sharp knife, leaving not more than one-quarter of an inch of stem at the butt of the pine. Careful handling of the fruit is most important, as it is very easily bruised. Before packing see that all fruit is thoroughly dry, particularly at the stem end.

As a control against water blister it is recommended by Mr. J. H. Simmonds, M.Sc., of the Pathological Branch, that during the wetter months a preventive treatment of the fruit with benzoic acid may be advisable. Prior to packing the cut end of the fruit, stalks should be rubbed either in pure benzoic acid powder or in a mixture of benzoic acid and kaolin. The quantity of kaolin should not exceed four times the weight of the benzoic acid and should be mixed with it very thoroughly.

## Grading.

As with all fruits, good packing is dependent on good grading. Pineapple grading is determined by selecting the particular pines of uniform size required to give certain counts. For instance, a twenty-four count represents twenty-four pineapples of even size to the case.

When the fruit is being unloaded at the packing shed it will be found expeditious to grade it into the various counts and to stack it tops down. Stacking in this way will permit better drying and easier handling.

## Type of Case.

The tropical fruit case 24¾ inches long, 12 inches deep, by 12 inches wide is the case used for both market and factory purposes. Case makers should exercise care when building cases. End boards must comply with correct measurements, 12 inches by 12 inches. When nailing sides and bottoms, overlap must be avoided, otherwise the cubic capacity of the case will be altered and standard packing rendered difficult.

**Branding of Case.**

Markings on the case should show at one end the variety (such as ''Smoothleaf'') and the number of fruit in the case: 18; also the packer's name and address: ''J. Smith, Woombye.''

**Packing.**

The packing of pineapples is, comparatively speaking, a simple matter. Varying shapes will occur in any particular variety, but, provided proper grading methods are used, no difficulty should be experienced in packing irregular shapes.

For general purposes the following methods of packing the various counts will be found satisfactory:—

| Count No. of Fruit to Case. | Diameter of Fruit. | No. of Layers in Case. | No. of Fruit in each Layer. |
|---|---|---|---|
| 11 .. .. | Large 5 in. .. .. | 3 | 4 x 3 x 4 |
| 12 .. .. | Small 5 in. .. .. .. | 3 | 4 x 4 x 4 |
| 14 .. .. | Large 4¾ in. .. .. | 3 | 5 x 4 x 5 |
| 15 .. .. | Small 4¾ in. .. .. | 3 | 5 x 5 x 5 |
| 18 .. .. | Large 4½ in. .. .. | 3 | 6 x 6 x 6 |
| 21 .. .. | Large 4 in. .. .. .. | 3 | 7 x 7 x 7 |
| 24 .. .. | Small 4 in. .. .. .. | 3 | 8 x 8 x 8 |

In explanation of ''large'' and ''small'' shown above, as the same diameter—a large fruit may be taken as one which will sit on a ring having a diameter of, say, 5 inches, but which will barely pass through a 5¼ ring. A small 5-inch pine would fit tightly at its centre in a 5-inch ring.

By reference to the illustrations the method of placing the fruit can be easily understood. It will be noted that with large and medium sized pineapples—viz., 11 and 14 counts—the layers are placed in one line only with the butts of the fruit touching the side of the case. This method of packing also applies to counts 12 and 15.

The smaller pineapples, such as counts 18, 21, and 24, are packed two rows to each layer and placed so that each fruit has its butt end alternately at opposite sides of the case.

Pineapples smaller than 4 inches in diameter should be disposed of at local markets. It may be more convenient to market such fruit loose, but where distance renders casing necessary, the method of placing the fruit in the case should be the same as shown in the 21 and 24 counts.

It is essential for the prevention of bruising that wood-wool, or other suitable material such as thoroughly dry blady grass, be used at the bottom, top, and sides of the case and between each fruit.

For factory requirements, pineapples less than 5 inches in length and less than 4 inches in diameter (measured from the centre of the fruit) should not be forwarded for canning purposes.

**Acknowledgment.**

Thanks are accorded Messrs. H. Willmott and Sons, of Victoria Point, for their assistance and the provision of material for the purpose of this paper.

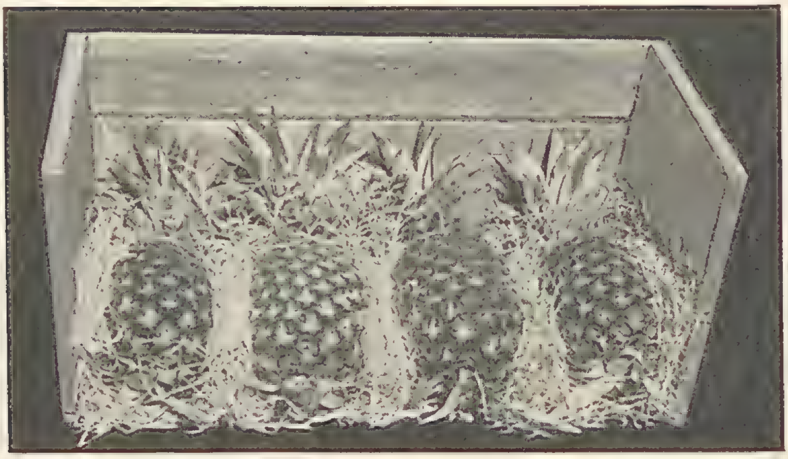

Plate 23.
11 Pack, bottom row.

Plate 24.
11 Pack, first and second layers 4 × 3.

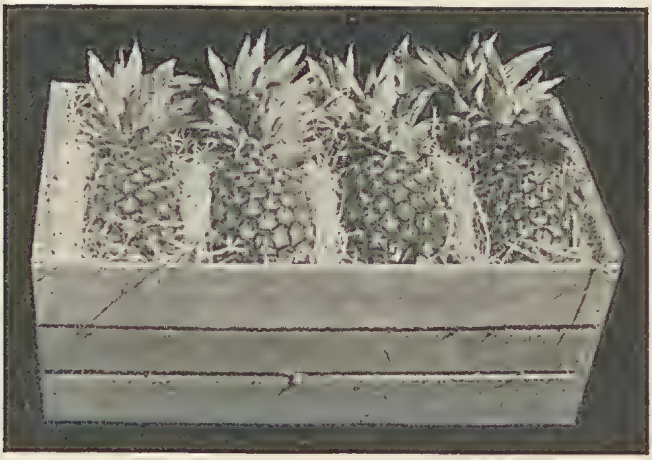

Plate 25.
11 Pack, top view of finished case. Three rows, 4 × 3 × 4.
Pines 5 inches in diameter.

Plate 26.
14 Pack, showing bottom layer.

Plate 27.
14 Pack, showing position of layers. Three rows, 5 × 4 × 5.
Diameter of pines (large), $4\frac{3}{4}$ inches.

Plate 28.
14 Pack, top view of finished case.

Plate 29.
21 Pack, bottom layer.

Plate 30.
21 Pack, showing position of layers. Three rows, 7 × 7 × 7.
Diameter of pine (large), 4 inches.

Plate 31.
21 Pack, top view of finished case.

# TUNG OIL FRUIT. (*Aleurites Fordii.*)

E. H. GURNEY and G. R. PATTEN.

THESE tung oil trees were planted by the Queensland Forestry Department at their Imbil Nursery in April, 1929, from seeds.

Analysis No. 1230. Australian strain on scrub land, Casey's Gully, R. 135. This seed received from Mr. A. R. Penfold, Curator, Technological Museum, Sydney, who stated these seeds were Australian-grown.

Analysis No. 1232. American strain on scrub land, Casey's Gully, R. 135.

Analysis No. 1231. American strain on forest land. The American seeds were received from Otto Katzenstein, seedsman, Atlanto, Georgia, U.S.A.

The young trees were planted approximately 25 feet x 25 feet, which is equivalent to seventy trees per acre. The Forestry Department state the only cultural treatment these trees received was two deep chippings during first year. The fruit analysed was harvested in April, 1932.

### Analysis of Dried Fruit.

| | | Analysis No. | | |
|---|---|---|---|---|
| | | 1230. | 1232. | 1231. |
| *Shell | per cent. | 38·1 | 34·0 | 34·5 |
| Kernel | per cent. | 61·9 | 66·0 | 65·5 |
| Average weight of a nut | grams | 3·57 | 3·01 | 3·29 |
| Average weight of a kernel | grams | 2·2 | 2·0 | 2·2 |
| Moisture in kernels | per cent. | 3·7 | 3·6 | 3·3 |
| Oil in kernels as received | per cent. | 57·8 | 57·4 | 58·3 |
| Oil expressed on moisture-free kernels | per cent. | 60·0 | 59·6 | 60·3 |

* Shell is Seed Coat or Testa, not outer Hull or Husk.

### Analysis of Oil.

The oil as extracted from the kernels with light petroleum was a yellow liquid.

| | | Analysis No. | | |
|---|---|---|---|---|
| | | 1230. | 1232. | 1231. |
| Specific gravity at 20°C. | | 0·9354 | 0·9391 | 0·9394 |
| Acid value | | 0·68 | 0·92 | 0·74 |
| Saponification value | | 191·1 | 189·5 | 193·6 |
| Iodine value (Wij's 3 hours) | | 170·5 | 169·6 | 174·9 |
| Unsaponifiable matter | per cent. | 0·24 | 0·42 | 0·42 |
| Refractive index at 28° C. | | 1·5119 | 1·5140 | 1·5149 |

The analyses of fruit from trees grown at Imbil compard favourably with analysis of fruit of tung oil trees (*Aleurites Fordii*) grown in other countries. The oil content of kernels is quite up to the average percentage. The colour and physical constants of the oil are practically in agreement with specification set down by the Australian Commonwealth Engineering Standards Association.

The following analyses of by-products were made to ascertain if they might be of any commercial value:—

| — | Australian Fruit (Scrub) Analysis No. 1230. | | | American Fruit (Scrub) Analysis No. 1232. | | | American Fruit (Forest) Analysis No. 1231. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Meal. | Testa. | Husks. | Meal. | Testa. | Husks. | Meal. | Testa. | Husks. |
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| Moisture | 7·21 | 9·05 | 9·78 | 7·29 | 7·99 | 9·68 | 6·04 | 8·51 | 9·28 |
| Crude protein (N x. 6·25) | 42·85 | 3·76 | 2·97 | 44·13 | 5·97 | 3·28 | 41·74 | 3·98 | 2·97 |
| Oil | 7·0 | 2·58 | 0·40 | 7·0 | 8·62 | 0·37 | 7·0 | 6·64 | 1·61 |
| Carbohydrates (by diff.) | 29·73 | 15·17 | 9·12 | 28·50 | 17·14 | 9·79 | 32·72 | 14·41 | 5·84 |
| Crude fibre | 6·07 | 65·80 | 67·95 | 6·14 | 56·85 | 67·32 | 6·25 | 64·35 | 71·02 |
| Crude ash | 7·14 | 3·64 | 9·78 | 6·94 | 3·43 | 9·62 | 6·25 | 2·11 | 9·28 |
| Lime | 0·47 | 0·62 | 0·28 | 0·62 | 0·75 | 0·71 | 0·62 | 0·69 | 0·50 |
| Potash | 2·27 | 1·07 | 0·93 | 1·56 | 0·84 | 1·16 | 1·74 | 0·35 | 0·48 |
| Phosphoric acid | 2·37 | 0·24 | 0·07 | 2·25 | 0·31 | 0·11 | 1·71 | 0·15 | 0·11 |

These trees were again harvested in April, 1933; the following results were obtained:—

| — | 1230 Australian Stock Scrub Land. | 1232 American Stock Scrub Land. | 1231 American Stock Forest Land. |
|---|---|---|---|
| Number of trees in experimental plot | 39 | 72 | 105 |
| Green fruit harvested from experimental plot | 1 cwt. 16 lb. | 1 cwt. 4 lb. | 1 cwt. 9 lb. |
| Green fruit per acre (equal 70 trees) | 2 cwt. 6 lb. | 1 cwt. 1 lb. | 81 lb. |
| Analysis of dried fruit— | | | |
| Husk .. per cent. | 48·7 | 51·7 | 49·8 |
| Testa .. per cent. | 23·0 | 20·0 | 21·4 |
| Kernel .. per cent. | 28·3 | 28·3 | 28·8 |
| | Grams Oz. | Grams Oz. | Grams. Oz. |
| Average weight of fruit | 33·6 = 1·185 | 32·6 = 1·138 | 33·2 = 1·171 |
| Average number of kernels in fruit | 4·6 | 4·46 | 4·76 |
| Average weight of kernel .. grams | 2·07 | 2·05 | 2·01 |

## BUNCHY TOP AND BEETLE BORER.

A Proclamation has been issued under the Diseases in Plants Acts, declaring that Fruit Districts Nos. 1 to 6, which were proclaimed in February, 1930, and comprise the South Coast, North Coast, Wide Bay and Burnett, Central, Bowen, and Northern districts, shall be quarantine areas for the purposes of the Acts, and determining the nature of the quarantine to be imposed in such areas in regard to Bunchy Top and Beetle Borer infestation of bananas.

The proclamation provides that the occupier or owner of any land within the quarantine area shall keep his property free from banana plants infected with bunchy top and beetle borer by following the procedure described below. In the case of plants affected with bunchy top, half a pint of kerosene must be poured down the central foliage of each infected plant, afterwards destroying the plant by completely removing it from the soil and cutting the butt into pieces of not more than two inches in diameter. Regarding beetle borer, the spent stem of the plant must be cut off at not more than six inches above ground level, and the severed stem split longitudinally along its whole length and cut transversely into not less than four pieces. The remaining portion of each spent stem must be cut off at ground level and, together with the cut surface of the corm, thoroughly dusted with a mixture containing one part by weight of paris green and six parts by weight of flour. The portion of the spent stem thus treated is to be replaced in its original position on the corm. It will now be necessary for banana-growers to keep their banana plantations free from bunchy top and beetle borer, irrespective of whether they are ordered to do so by an Inspector or otherwise.

# THE BOY EMPLOYMENT PROBLEM.

## ST. LUCIA FARM SCHOOL.

J. F. F. REID.*

FROM the pages of history we learn that every year during the early development of the Roman Empire it was decreed that with the coming of the spring the virile youth of the community, being superfluous for its economic needs, must seek a life in some other part of the country. Year after year, and decade after decade, this spring-time migration went on, with the result that in successive generations vigorous young colonies were established throughout Italy, and consequently formed a basis for the extension of the Roman State.

To-day, I submit, from that slab of history we can learn a very fine lesson. What we should do with our boys is, I also submit, a cry that should not be heard in this under-populated and comparatively undeveloped continent. "There are still unredeemed empires in the West," and, it should be added, in North Australia. It is not proposed, of course, to discuss the causes of the present economic situation, but we certainly have to deal with its effects, especially in respect of the problem of unemployment. The problem is not a new one, yet its existence in its present magnitude is a direct challenge to the statemanship and citizenship of this Commonwealth.

Looking around this country, we see extraordinarily valuable latent national assets calling loudly for development—illimitable coal measures, rivers calling for locking for water conservation, soils calling for scientific study of their potential productivity, and so on to the end of an impressive and very lengthy list. All this work that is calling to be done could absorb the labour of generations—and yet one of the greatest, most pressing, and distressing problems of the day is that of unemployment, and especially that of the unemployment of our growing youth.

We talked a lot about man-power during the war. Then we suddenly realised that, after all, the greatness and strength of a nation is made up of the men and women who compose the nation; and that the real capital of a country is the character of its people. The parents who were able to send six stalwart sons to the trenches and gun pits were regarded as national benefactors. Badges were presented to mothers of young men who had enlisted to bear witness of patriotic sacrifice. Such is the topsy-turveydom of our social system that to-day the possession of a family of growing sons is a source of grave anxiety to any parent as to the chances of their obtaining suitable, useful, and profitable employment in their own native land. We lost one generation during the war, and there is very serious danger of our losing another generation, socially speaking, during the peace.

Fortunately, we are able to realise that those who really count in a nation and those who govern its destinies for good or ill are those who are born and live and work in it. Also, it is believed that we are becoming more appreciative of the fact that no society is properly organised until every youngster born into it shall have a real opportunity in life. We are learning that crude and rather callous parsimony may be mistaken for genuine economy; and that we cannot solve the problems of an age of glut by cutting down consumption.

Fortunately, too, we are making an effort, particularly in respect of the boy employment difficulty, to tackle the problem with sympathy, intelligence, and resource. To refer to only one important line of effort, some of the best brains, some of the most thoughtful men and women of the community are searching for practical means of giving the boy a chance and a place among the nation's workers. The land, they perceive, is one way out, though it is recognised that the mere placing of people on the land will not settle our economic problem. It is certainly placing them in a position of at least producing their own food, but, of course, something more than that is required. Oxygen must be pumped into all our struggling industries, and other heroic measures taken to cure the general economic disorder.

### To-morrow's Manhood.

In the blood of every capable and enterprising Australian youngster is a spirit of progress that should not be thwarted by any mistake in national policy. As a natural sequence of any back-to-the-land movement must be a comprehensive land settlement policy providing not merely for living areas, but for areas sufficient for the branch of primary industry engaged in and for the needs, in the case of the individual, of a growing family whom it is desired will remain on the land. A

* In a radio address from 4QG.

Plate 32.—The Staff of St. Lucia Farm School.

Seated, left to right—Messrs. F. O. Bosworth, B.A. (Principal), and S. D. Hartley (Farm Foreman).

Standing, left to right—Messrs. A. Crees (in charge of dairy), D. Mullins (cook), J. A. Kerr (Instructor in Agriculture).

Plate 33.—St. Lucia Farm School—Group of Trainees.

Most of these young men have completed their six-months course and are now engaged in regular rural employment in the agricultural districts of the State.

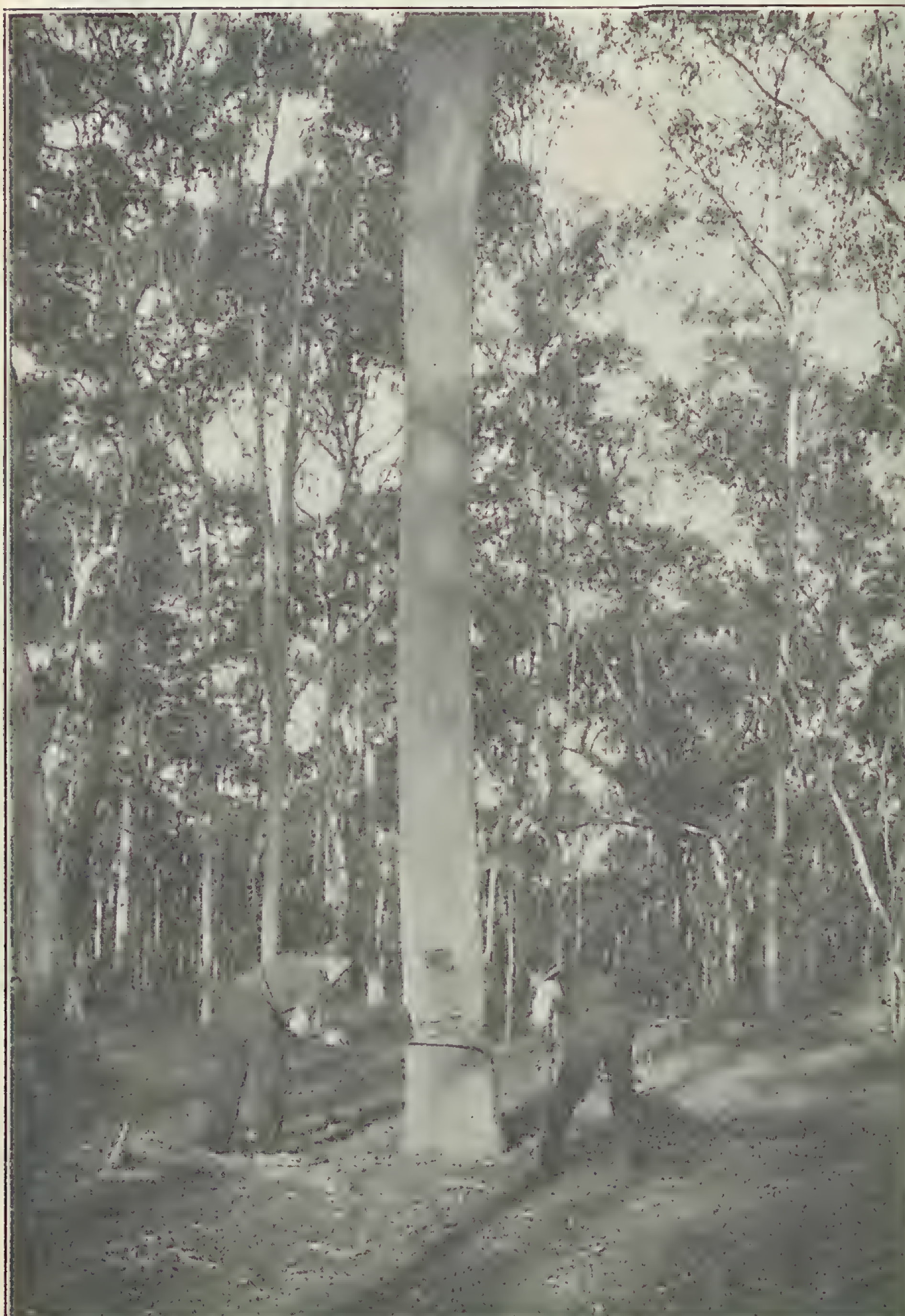

Plate 34.—Sawing the Back Cut.

St. Lucia Trainees are taught various branches of bushcraft in the Queensland University forest lands at Moggill.

Plate 35.—Stand Clear for the Crash!
The falling tree was belly-scarfed and sawn by St. Lucia Farm Trainees in 7¼ minutes.

PLATE 36.—BARKING THE FALLEN LOG.
Preparatory to sawing it into fence-post lengths.

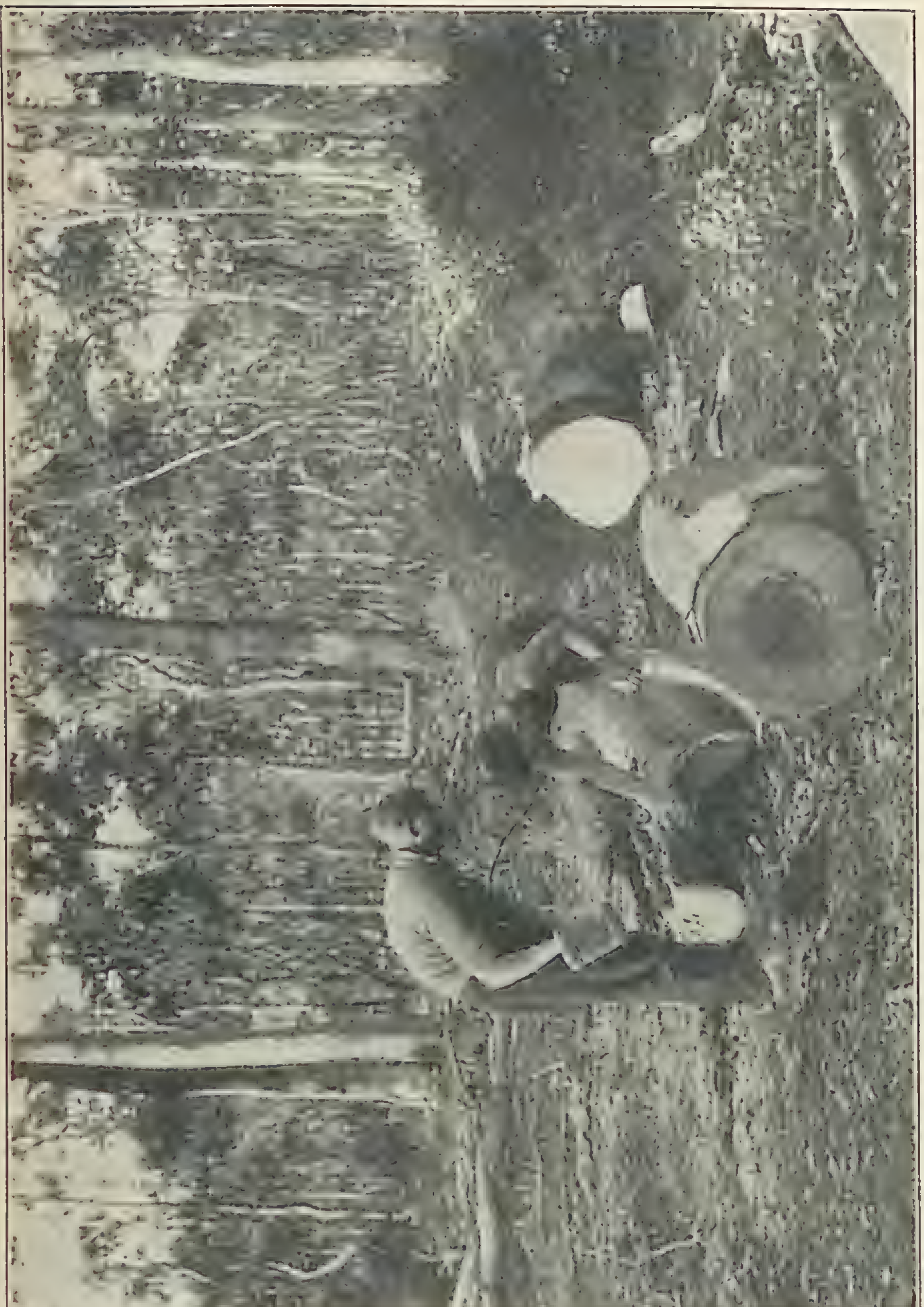

Plate 37.—Entering a Wedge.
St. Lucia Trainees engaged in splitting fencing timber.

prosperous yeomanry rather than a struggling peasantry should be our aim in this country. A realisation of those facts is behind the St. Lucia Farm School, the Boy Employment Scheme of the Department of Labour and Industry, the schemes fostered and capably directed by all the churches, the New Settlers' League, the Rotary Club, and the Legacy Club—an association of Diggers who regard their work not as a charity but as a duty voluntarily assumed; and in this spirit they carry on, overcoming difficulties as they arise, shunning personal publicity, and proving quietly but splendidly that the spirit of the A.I.F. has survived and is still an effective force in Australian national life. It is not possible, of course, to deal with the activities of all these public bodies in a short talk, but what may be said of the St. Lucia Scheme is typical, at least in spirit, of them all.

**St. Lucia Farm School.**

St. Lucia Farm School was opened by the Hon. Frank W. Bulcock, Minister for Agriculture and Stock, on 31st January with fifty boys, ranging in age from seventeen to twenty years, all coming from the Brisbane city area. Half the boys are boarders and half are day boys, and shifts are changed periodically, the day boys becoming boarders for a term, and the boarders becoming day boys. Mr. Bosworth, of the Queensland Agricultural High School and College, is in charge. The 170 odd acres of the St. Lucia Farm comprise the land that has been generously given as a university site by Dr. and Miss Mayne. Fifty or sixty years ago this land was growing sugar-cane and other crops, and a considerable area of it consists of fertile river flats. As the University is not likely to occupy the area for some years to come, it could not be put to a better immediate use than that of a training ground for potential primary producers.

PLATE 38.—SIGHTING A LINE OF FENCING.
Example of practical instruction at St. Lucia Farm School.

Since the school has been opened the boys have been given instruction in tree-felling, splitting, fencing, ploughing, harrowing, sowing, and butter-making, general dairy practice, and pig raising. Officers of the Department of Agriculture and Stock visit the farm regularly to lecture on pig raising, dairying, fruit and vegetable growing, animal hygiene, botany, poultry raising, chemistry of the soil, insect pests, and general farming topics. Besides the farm at St. Lucia there is a tent camp in forest country at Moggill, also belonging to the University, where the boys are instructed in bushcraft and pioneering work, supplying fencing and round building timber for headquarters; groups of boys are also sent out to the Beerburrum settlement for instruction in tobacco raising and the curing and grading of tobacco leaf. Accompanied by an instructor, the boys also visit on occasion the Roma Street Markets, the Kingston Butter Factory, and a stud pig farm at Kingston.

Piggeries—portable and permanent—have been built by the trainees on the farm; five brood sows of the Tamworth, Large White and Berkshire breeds are housed there, and litters of pedigree and crossbred pigs are being raised mainly for purposes of instruction in piggery management.

The dairy herd consist of twenty grade Jersey cows, which supply milk and butter for the establishment. Practical instruction in herd testing is given, and occasionally groups of boys visit the Department of Agriculture and Stock for further instruction in that important branch of animal husbandry.

Disc and swing ploughs are at work on the farm, and already about 2½ acres of lucerne and an acre each of rye and barley have been planted. An additional 15 acres have been ploughed for summer crops.

Poultry pens have been erected by the boys. Elementary blacksmithing, use and care of farm implements and machinery, and the running of an internal combustion engine are included in the general training. A fine football field and a tennis court have also been cleared and laid out by the boys.

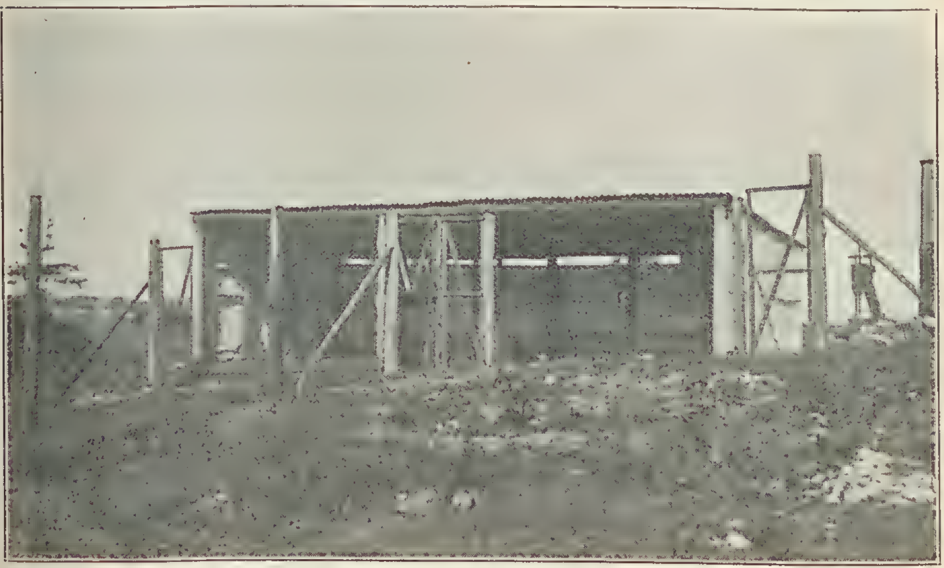

PLATE 39.—POULTRY HOUSE AND PENS AT ST. LUCIA.
All buildings and dividing fences were erected with material from the Moggill forest by trainees as part of their general course of instruction.

At the end of July the first group of twenty-five boys from the St. Lucia Training Farm completed their course of training in the rudiments of rural industry and were absorbed in farm employment; at the end of October another twenty-five will be available for farm employment, and thereafter similar groups will be available every three months. As each group goes, a similar number will be enrolled to keep the strength up to fifty—the prescribed number. The boys pay no fees and receive free board. At the end of the term of six months two boys from each group of fifty will be granted scholarships to Gatton College.

Parents who desire that their boys should enter the school should get in touch with Mr. McGillivray, of the Central Technical College, Brisbane, and farmers who desire the services of the boys who are about to finish their term should communicate immediately with the Lads' Employment Bureau, Box 1448T, General Post Office, Brisbane. The boys represent a very fine stamp of Australian youth, keenly intelligent, country conscious, active, and imbued with a very fine spirit.

This, in brief, is the outline of a scheme of farm training prompted by a general desire to counter an effect of the present economic situation and a realisation of the wisdom of directing the youth-power of the land—to-morrow's manhood—into fields of primary production. One of the ideas behind the scheme is that workless city boys should be given an opportunity of cultivating an inclination towards country life.

It is suggested, in conclusion, and as apposite to my opening remarks, that a practical effort must be continued to readjust our lop-sided distribution of population. The transference of town lads to the country where they will gain practical experience and a "land sense" is regarded as a preliminary only to their becoming either share farmers or farmers on their own account. It is also suggested that the direction of the mind of our youth to rural occupations cannot be regarded merely as a temporary expedient, but as the first step in a movement back to the land, of which adequate settlement and development is essential to the fulfilment of our national destiny.

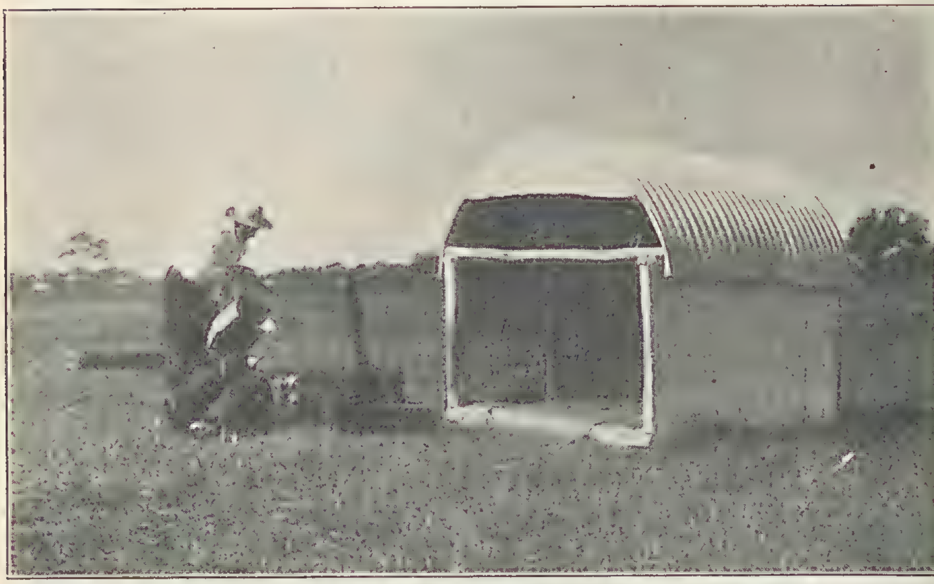

Plate 40.—Feeding the Morning Milk to a Hungry Litter.

Piggery management is part of the curriculum at St. Lucia Farm School. The portable shelter was constructed by the boys from scrapped material found on the farm.

Plate 41.—A Corner of a Piggery, St. Lucia Farm School.

PLATE 42.—YOUTH AT THE PLOUGH.
Learning to open a straight furrow at St. Lucia Farm School.

PLATE 43.—GIVING THE HORSES A "BLOW."
A scene on St. Lucia. The lad was receiving his first lesson in ploughing and the handling of a team. Mount Coot-tha and D'Aguilar Range in the distance.

Plate 44.—Preparing Land for Lucerne.
Plough teams in charge of trainees at St. Lucia.

Plate 45.—Points of a Good "Poddy."
A Dairy Instructor demonstrating at St. Lucia Farm School.

# BEERBURRUM TOBACCO SETTLEMENT.

Plate 46.—Grubbing a Forest Giant.
Clearing land for tobacco at Beerburrum.

Plate 47.—Beerburrum Settlement.
A tobacco-grower's temporary home.

Plate 48.—Another Temporary Dwelling on the Beerburrum Settlement.

Plate 49.—A Bush Home at Beerburrum.
The new settlement of tobacco-growers at Beerburrum has shown good progress in its first year.

Plate 50.—"As the Twig is Bent . . ."
Little Queenslanders on a Beerburrum Tobacco Farm.

Plate 51.—City Children becoming Country-conscious.
Scholars and a temporary school house on the Beerburrum Tobacco Settlement.

Plate 52.—A Settler's First Tobacco Crop at Beerburrum.

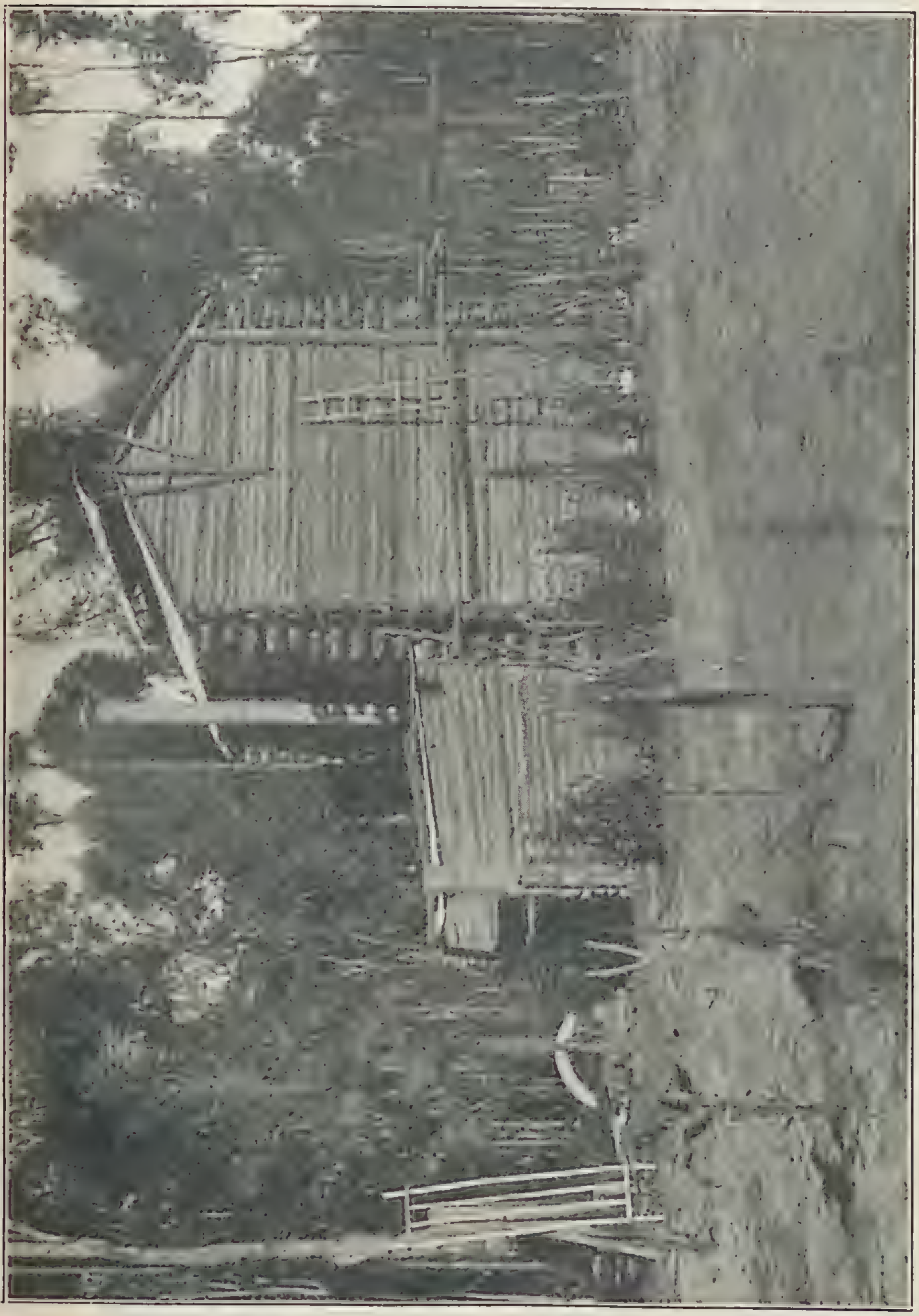

Plate 53.—A Log Tobacco-curing Barn, Beerburrum Settlement.

Barns of this type built from material on the spot have been erected by the settlers on most of the farms.

PLATE 54.—BEERBURRUM SETTLEMENT, TOBACCO GRADERS AT WORK.
The girls are the daughters of settlers, and they are proving very skilful in their new job under the supervision of officers of the *Department of Agriculture and Stock.*


Plate 55.—First Fruits of Industry.
Tobacco on a Beerburrum farm baled for sale.

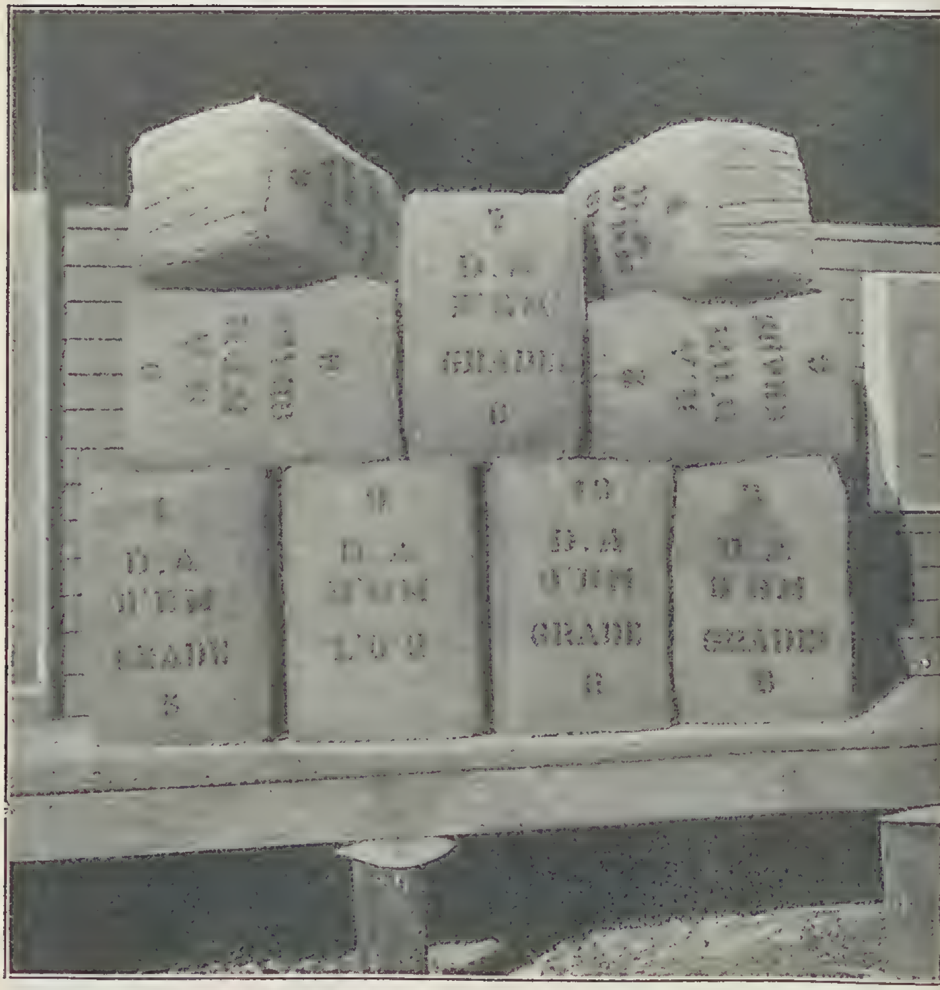


Plate 56.—Beerburrum Tobacco Ready for Railing to the Brisbane Market.

## A PLANT POISONOUS TO LIVE STOCK (*Cestrum Parqui*).

By J. A. RUDD, L.V.Sc. (Melb.), Director, Animal Health Station, Yeerongpilly, and C. T. WHITE, F.L.S., Government Botanist.

*Description.*—A shrub 4 to 5 feet high, suckering very freely from the base. Leaves with a rather offensive odour when crushed, lanceolate in shape, dark, rather dull green above, paler beneath, 2 to 4 inches long, ½ to 1 inch wide, on a leaf-stalk or petiole of about ¼ inch. Flowers in bunches (panicles) terminating the branches, the flowering branches usually somewhat curved or pendant; individual flowers yellowish green, often somewhat brownish, narrow-tubular, ¾ to 1 inch long, the upper part or limb divided into five small acute lobes. Fruit black, shining, elongately egg-shaped. Seeds angular, embedded in a juicy dark-purple pulp.

Plate 57.—A Shrub Poisonous to Live Stock (*Cestrum Parqui*).

*Distribution.*—A native of Chili and the Argentine, South America, now a common naturalised alien in South-Eastern Queensland, especially in vacant allotments around towns.

*Common Name.*—We have not heard a common name given to it in Australia, but the botanical one is short enough for general use. In the Argentine, according to an article by Dr. L. F. Ruiz in the "Bulletin of the Ministry of Agriculture" of the Argentine Republic (Vol. 29, pp. 52-55), it is variously known in that country as "Duranzillo," "Duranzillo Negro," and "Palque." A French name for the plant is "La Parquina."

*Poisonous Properties.*—According to Dr. Ruiz, in the article just referred to, some notes on the chemistry of the plant were published by J. Mercier and J. Chevalier in the "Bulletin des Sciences Pharmacologiques" for October, 1913, where it is stated that the poisonous principle is due to an alkaloid.

*Effects on Stock.*—We have never known horses to touch it although feed in the paddocks was decidedly short, even up to starvation point. Cattle and sheep however, will eat it if fresh feed is scarce, even if they are fed on chaff and in first-class condition, particularly in the late winter and during frosty weather. It brings on paralysis of involuntary muscles soon after being eaten; loss of cud in ruminants follows constipation at first with blood-stained fæces; dry muzzle; temperature up to 105 deg. Fahr. This is rapidly followed by a general paralysis and death in great pain. The rapidity of onset of these symptoms is dependent upon the quantity consumed and the peculiar resistance of the animal, which refuses all food long before death, but may, however, drink a very little water before death. Post-mortem examination reveals visible mucous membranes, cyanotic, enteritis, with marked blood extravasation along the whole alimentary tract, with hæmorrhage in parts into the tissues of the bowel.

*Eradication.*—At the present time the plant is nowhere so abundant but that hand eradication will be found the most effective means of control. After the parent plants have been cut off below the soil level, or pulled out, numerous suckers will come up from the old roots. These must be chipped or hand pulled regularly until the old roots have become exhausted. If preferred they can be poisoned, but the young shoots will have to be sprayed several times until the old roots fail to send up any more suckers. This may have to be persisted in for as many as five seasons before the plant is finally destroyed.

*Botanical Reference.*—Cestrum Parqui L'Her. Stirp. Nov. 73.

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## CHEAP RUGS FOR DAIRY COWS.

Where proper shelter is not provided for stock, not only is their resistance to disease reduced, but much food material is wasted in "warming the wind," or, in other words, meeting the increased demands of an exposed body. This fact has an important application for dairy farmers. A cow's food is only devoted to production after the animal has satisfied its needs for nourishment and heat. In assisting the cow to conserve the last mentioned, especially in colder districts and situations, the rugging of the animals during, at any rate, a portion of the winter is well worth while.

Many fa ners would like to rug their cows, but cannot afford to purchase the market article. The farmer can, however, make his own cow rugs for little more than the cost of two or three cornsacks or other heavy bags, a ball of twine, and a sewing needle, plus his own ingenuity, points out a departmental leaflet. Two bags, or three for larger cows, will make an effective rug if utilised as follows:—

Split the bags down the seams and join together, and place on the cow. Next cut off a strip from 10 to 18 inches wide so that the rug will not hang too low. This need not be wasted; it is folded, and when sewn to the rug provides the strap for the thighs, this being the only strap used. The front is now fitted by turning up the front corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion which the cow would tread on. The two turned-back portions are then measured and sewn to fit fairly tightly to the cow's neck. The back strap is fitted 12 to 15 inches below the rump level, and the rug is complete.

This home-made rug will keep the cow warm, and after a few days' wear, when the oil, &c., from the cow's body has worked into the rug, it will also be water-proof. The rug can quite easily be slipped off and on over the cow's head, and it is advisable to remove it daily except on rainy or very bleak days. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs.

A trial on one or two cows will prove the efficacy of these rugs, the animals soon showing their appreciation in a practical manner.

# FRUITGROWING IN NORTH QUEENSLAND.

*The Minister for Agriculture and Stock (Mr. F. W. Bulcock) has received the following report from Mr. H. J. Freeman, Senior Instructor in Fruit Culture, Cairns, upon fruit matters generally in North Queensland for the second quarter of the year.*

## Citrus Fruits.

CAIRNS produced the heaviest crop of both mandarins and oranges for any individual district between Cooktown and Townsville, though the other districts have produced crops of slightly greater proportion than that of last year.

As a consequence, prices have not been very satisfactory. Whereas it is usually an accepted fact that good quality mandarins demand a better price than equally good oranges, there are many instances this year where such has not been the case. This is entirely due to two causes, the first being the proportionately bigger crop of mandarins as compared to the orange crop, and the unseasonable weather conditions existing, whereby it was impossible to get the fruit to hold. The fruit ripened so quickly during the exceptionally humid June weather that many orchardists were sorely troubled by having to destroy such large quantities of windfalls which had reached such a state of ripeness that they simply dropped from the tree. Having no cold weather has been instrumental in allowing the fly to inflict damage in districts south of Innisfail, in which, during ordinary seasons, fruit is not injured to any serious extent by this pest.

Local lemons of excellent quality can be purchased for a few shillings a case. It has always been surprising that more growers do not resort to storing; holding the lemons until an appreciable rise in temperature would naturally help to improve the price of lemons considerably, as well as to create a very keen demand as compared with any autumn or winter sales.

## Other Fruits.

Locally, pineapples are still scarce.

A crop of granadillas commenced ripening during the first week in June and for the balance of the month there was no shortage in this line. At the correct time, a trial consignment of this fruit to the Brisbane or Sydney markets would bring forth results that should be quite pleasing.

Passion fruit is very scarce and, in many instances, a fungus attacking the vine just above the ground surface level has been destructive. Along the northern coastal area, it is essential to plant out a number of new vines each year.

For a short period during May, there was a general shortage of papaws throughout the northern coastal areas. This was somewhat of an unusual happening, as the North is capable of producing a never-ending supply of this beautiful fruit. However, this period passed and papaws of excellent size and quality are again to be seen in practically every centre where fruit is offered for sale.

Our output of bananas during the past three months has been remarkably small and I have noticed, unfortunately, even though we are producing only sufficient to satisfactorily supply local requirements, that it is a very difficult matter to find any fruit of good quality being offered for sale. This means that even for local sales we must look to newly planted areas for our supply of good quality fruit during the coming summer. Leaf Spot is very much in evidence, as also is Root Rot, and the humidity of the autumn season has, this year, allowed the fly menace to continue almost uninterruptedly.

From reports to hand, the Herberton-Ravenshoe vineyards have been cleaned, and pruning will be commenced in the very near future. Some extra planting is expected to take place, and varieties that will yield better quality berries have been recommended. A decidedly temperate district, such as the Herberton-Ravenshoe area lying adjacent to a distinctly tropical zone, naturally possesses a fine asset, inasmuch as a ready sale for all temperate products can be made in the towns on the tropical coast below the Dividing Range.

Because of the geographical position of this hinterland and the nature of its soil conditions, and also because of the vastness of the tropical belt of country extending from Townsville to Cooktown, I consider the possibilities of this higher country have never been developed to the extent they should—nor have the possibilities resulting from such development ever been realised, except by very few.

Inquiries were received during June concerning the possibility of securing land in the North for the growing of tea, coffee, and cocoa.

## PIG IMPROVEMENT SCHEME.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

REALISING that the interests of stock men generally and particularly those of pig raisers are best served when development on sound economic lines goes hand in hand with extension of marketing facilities, the Minister for Agriculture and Stock (Hon. F. W. Bulcock) in this State has, with the co-operation of various interests associated with the industry, been devoting a considerable amount of time recently to organising and making due preparation for extension of activities which must necessarily follow the opening up of overseas market outlets for Queensland's pig products. A résumé of activities of the Queensland Pig Industry Council also indicates progress and assures pig raisers that their interests are being carefully guarded in the advance that is being made.

The formation of the Queensland Pig Industry Council in April last was an earnest of the desire to bring all parties together around a common table to discuss the pros and cons of the business, and to lay plans for future development of this, one of Queensland's most progressive live-stock industries.

The plan adopted on inauguration of the Pig Council was to arrange for various sub-committees to take control of sectional activities and to devote special attention to these prior to a calling together again of the parent body.

In his numerous references to the pig industry in this State, the Minister has drawn attention to the fact that although it is one of the oldest industries in the world, dating back to scriptural days, the pig industry has been a very neglected one and has received the least attention of all, and more particularly from the economic point of view.

A stage has now been reached owing to altered demands of consumers the world over when, in order to make the carcases of pork and bacon pigs acceptable to the trade, certain characteristics have to be developed without which it will be impossible to have permanent access to the world's markets. Formerly a short fat pig was regarded as the breeders' ideal; to-day the long, lean, quick-growing and early-maturing pig is to the fore, and for the export trade white-skinned pigs are in particular demand.

Without doubt, as Mr. Bulcock points out, the time is opportune—even more so than a few years ago—for, with the inauguration of the Queensland Meat Industry Board and Brisbane Abattoirs, and with the hearty co-operation of the board's officials, together with the reorganisation of the Animal Health Station at Yeerongpilly, an excellent opportunity is provided for engaging in considerable experiment work in problems relating to nutrition, preventive measures in disease control, research into mortality in young pigs, and for carrying out efficiently organised feeding tests with Queensland products like meat and protein meal and the by-products of the cotton and other industries.

The Minister has emphasised on more than one occasion that the fundamental necessity is to secure a fair and equitable return for the labour the farmer puts into his work and on his capital invested in land and stock.

With a view to assisting approved farmers to improve their pig herds, and thus assist in developing the industry, the Better Boar scheme has been introduced and is being pushed on with.

Under this method of pig improvement, selected boars of a breed recognised the world over as being suitable will be made available to approved farmers on a subsidy basis—that is to say, the department will bear half the total purchase price of the boars purchased under the scheme provided application is made on forms to be provided and that the farmer agrees to the department's proposals.

Another important move by the Minister has been the provision at the Animal Health Station of a Pig Experiment and Research Section, especially for experiment work.

# AGRICULTURAL NOTES.

By H. S. HUNTER, Department of Agriculture and Stock.

GENEROUS and unexpected rains in July revived the demand for live stock, and caused a decline in farm fodder prices. It is too early to look for a spring in pastures, but a profusion of clovers and winter herbage is reported from many districts.

Improved seasonal conditions have greatly eased the situation, especially in the dairying country where dry weather in conjunction with low butter-fat prices were creating considerable anxiety. A wonderful response has been obtained from winter-growing fodder crops, which were practically at a standstill and could not be grazed without being pulled up by the roots. In a short space of time these will provide good grazing or material for cutting and feeding to stock.

The subsoil, which had become depleted of moisture owing to a long absence of good soaking rains, has now received a thorough saturation, and the spring season can be looked forward to with every confidence. It is a matter for gratification that the State's principal cotton belt has participated, and so has been assured of favourable conditions for planting at the period of the year most suitable for the purpose, an important factor governing successful cotton production. It now remains for the growers to adopt approved methods of cultivation until the planting time arrives.

The preparation of land is being pursued with vigour to conserve moisture and to get the soil into readiness for planting with maize, cotton, potatoes, pumpkins, dairy fodders, and other summer-growing crops, as soon as the danger of frost has passed.

Early plantings of potatoes have already been made and should be assured of a good start. For the spring planting seed has to be obtained from southern States, as tubers harvested from autumn-planted crops are not sufficiently advanced for the purpose. Seed potatoes should be selected, when possible, from localities which are free from disease. When there is any possibility of infection by fungoid growths it is advisable to immerse the potatoes for one hour in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water. Before rebagging for conveyance to the field the potatoes should be thoroughly dried and the bags treated in a similar manner.

## The Wheat Outlook.

Wheat sowing practically has been completed under conditions, in most districts, fairly satisfactory for a good germination, but the greater part of the main wheat belt will require further rains in the near future before the position can be regarded as entirely satisfactory. The question whether Australia is to restrict the production of wheat may yet be decided by Mother Nature. The dry spell, which until recently afflicted Queensland, has extended also into the wheat areas of the southern States, resulting in a faulty germination. Rains in June provided some relief when many of the crops were in a critical condition, and the July downpour has now assured a fair harvest, subject, of course, to later falls.

One factor which, to some extent, has aggravated the world wheat problem is the unusual run of favourable seasons for the past five years in practically all important wheat-growing countries. This appears to have been broken, judging by the reports of an adverse season in North America, which are responsible partly for the recent appreciable rise in overseas wheat values.

## Grading Tobacco Leaf.

Tobacco-curing operations now are completed, and growers for the most part are engaged in grading the leaf prior to offering it for sale. This is really a most important stage in the primary industry of tobacco-leaf production, and whether this operation is carried out by the grower himself or by a commercial grading establishment on his behalf the responsibility is his to see that the job is properly done. Buyers have repeatedly declared that they do not want ungraded or badly-graded leaf, and the point has been emphasised further by their refusal to bid for parcels at the last auction sale, which otherwise were quite saleable, in so far as leaf quality was concerned. A feature of the last sale was the improved quality of some of the offerings, which were grown under irrigation in the Texas and adjoining districts and in the Tamworth and Ashford districts of Northern New South Wales.

Failures of crops in many of the tobacco-growing districts this season have emphasised the dangers to which single-crop regions are exposed. In such regions a crop failure, or a collapse in market values, creates an embarrassing position. This position has been felt keenly of recent years in some of the Southern wheat-growing areas, and, to some extent, in the cotton belt of the Callide and Upper Burnett.

Fortunately the cotton lands were capable of being developed also for dairying and mixed farming, and the Southern wheat areas could be utilised to some extent for other farming activities, but the tobacco lands of Queensland are in a different category, as tobacco is grown on soils unsuited for other forms of agriculture. In fact, they present a problem for the cultivation of green manure crops necessary for restoring humus to the soil.

### Farming on Central Coast.

For some years wheat has been grown to a limited extent for grain production in the Central Division, notably in the Dawson Valley. In recent seasons many of the crops originally intended for grain production eventually were fed off to stock, either because of their unsuitability for grain or on account of a fodder shortage. Wheat sowing for the current season practically had been completed prior to the rain, and the young crops will be assured of an excellent start. Throughout the area in question there are many comparatively new settlers, who, making a start on their holdings with cotton, have been endeavouring gradually to build up dairy herds, so that reliance would not have to be placed entirely on one crop. The past unfavourable seasons have hampered their efforts in this direction. The area under cultivation gradually is expanding in the Central Division. In the inter-coastal mixed-farming districts, lucerne, maize, potatoes, pumpkins, onions, broom millet, and dairying and pig fodders are grown, in addition to cotton and wheat. Peanuts are an important crop in the vicinity of Rockhampton, and the coastal lands lying between that city and Mackay have produced some of the best tobacco leaf so far grown in the Commonwealth. In addition, considerable expansion has attended the extension of the dairy industry to the immediate hinterland of Mackay.

### Fruit Sales.

The cold weather has had a depressing effect on fruit sales, particularly of oranges and pineapples. In addition, local fruits have had to compete with Southern oranges and with heavy supplies of apples and pears from Tasmania. Strawberries are coming forward freely. A heavy crop is being harvested this season on the Blackall Range, whence consignments are being forwarded to Brisbane and Sydney markets. The fresh fruit market is being relieved by the acceptance of strawberries for factory purposes. Consignments of factory strawberries forwarded to the Committee of Direction must consist of stemmed, clean fruit, and arrive in sound, unfermented condition. Stale fruit should not be included. Potatoes continue to realise good prices, provided they are of satisfactory quality. The demand has improved for other good-quality vegetable lines.

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## THE WHEAT POOL.

Executive approval has been given under "*The Wheat Pool Acts*, 1920 *to* 1930," for the issue of the State Wheat Pool Election Regulations, which rescind the existing election Regulations. These provide that the Wheat Board shall consist of four representatives of growers, instead of five as previously, to be appointed from the 1st September, 1933. Also, the members of the Board shall be elected by the wheat-growers voting as one constituency, and shall not be elected from certain districts as was provided in the old Regulations. The representatives on the Board shall be elected by postal ballot by those growers of wheat who furnished returns of wheat for the 1932-33 season, those to whom seed wheat has been supplied by the Wheat Board for this year's planting of not less than 10 acres of land for delivery of the resultant grain to the Wheat Board, and other bona fide growers of not less than a similar area who may make application for a voting paper.

Plate 58.—Scholarship Class, Nambour Rural School.

On an instructional visit to the Department of Agriculture and Stock. The young people were keenly interested in the scientific and technical services of the Department. Seated in the centre from left to right are Messrs. H. J. Bonham (Teacher in Charge), W. A. Zerner (Head Teacher, Nambour Rural School), and J. F. F. Reid (Department of Agriculture and Stock).

# SHEEP STATION MANAGEMENT.

J. L. HODGE, Instructor, Sheep and Wool.*

It does not necessarily follow that an expert wool man would make a successful property manager. As a matter of fact the dual position, sheep and wool, is a difficult one to fill. On the other hand, it is not essential that a station manager should be an expert wool man; however, a sound knowledge of wool is to be desired. A thorough knowledge of all stock is also required. The man should be a good man over men, firm but just, and with a capacity for work. A sound knowledge of improvements and their value is of importance. His knowledge of country and its carrying capacity is essential.

## Flock Management.

The cost of feeding a bad sheep is just as great as the upkeep of a good one, and it is therefore necessary that the successful manager should keep constantly before him the improvement in his flocks. Apart altogether from type, this is to be achieved in two ways—breeding and culling—firstly, in the use of better rams, and, secondly, in the culling of the ewes. Either operation practised separately is of value, but the full value is not gained unless the operations are carried out together. First fix in the mind's eye the type likely to do best and be most profitable in the particular locality. This is of importance, because a type of merino, suitable for, say, Stanthorpe district, may prove a failure if depastured in the far West and Central districts of Queensland where drought has to be contended with. In this connection, it is as well to remind growers at once that price per pound of wool is not everything. In fact, where the constitution of the animal plays such a big part, price per head is of greater importance. In the matter, then, of the purchase of rams and the culling of ewes, if the manager has sufficient knowledge for this important work, well and good. If not, he would be well advised to employ a recognised authority.

With regard to cull ewes, we in this Department would like to see them sold as fats where that is possible, and not passed on as breeders to other graziers. It is admitted, of course, that in some cases station culls are as good in quality and constitution as the smaller grower can procure locally, but this is the exception and not the general rule.

Having then fixed a type likely to be most profitable under conditions existing, such as locality, average rainfall, prevalence of drought or otherwise, water conditions, and distances to be travelled, it is advisable to stick as closely as possible to that type. Chopping and changing about in the use of rams is not recommended. Under ordinary pastoral conditions rams may be joined up with ewes eigheen months old to lamb then at about 4 tooth.

During pregnancy the ewes should be maintained in good, strong condition, without allowing them to become too fat. After lambing, and with lambs at foot, the feed cannot be too good. Weaning depends to a great extent on local conditions and the growth made by the lambs. If good feed is available, merino lambs may be weaned at about five months old. They should, of course, get the best feed offering.

## Improvements.

A thorough knowledge of improvements, their cost, and the necessity for them should be part and parcel of the equipment of the manager of a pastoral holding. Fencing and its value is a necessary part of his knowledge; the conservation of water, where surface water is necessary, should be one of his first cares; the value to the station to be derived from expenditure of money in ringbarking is of first importance. The wise maintenance of improvements calls for economic expenditure. All these items taken together call for qualities of wise judgment on the part of the successful manager. Original improvements, such as the homestead, the shearing shed and its equipment, huts, horse and cow yards, the dip, drafting yards, and fencing call for experienced judgment in the matter of the necessity for them, and the capital value of the property when so improved. It is easy, when the money is available, to over-capitalise a property, and this means a direct loss to the extent of such over-capitalisation.

## Lamb Marking.

Lamb marking is an annual operation on the property and calls for organisation. Have everything ready before the ewes and lambs are mustered and yarded, and avoid that state of unpreparedness which sometimes prevails to the detriment of the stock.

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* In a radio address from Station 4QG.

The actual operation calls for efficiency, cleanliness, and despatch, and should be carried out in yards known, as nearly as possible, to be free from germs such as tetanus. Where circumstances permit, we like to see lambs marked in yards erected temporarily for the purpose in the paddocks in which the ewes and lambs are to be let go. The best age at which to mark lambs is from a fortnight to a month old. The utmost cleanliness is necessary in the operation. Knives and other implements used should be dipped freely in a good antiseptic. A recognised preparation, both antiseptic and curative, should be applied to the wounds, and the ewes and lambs removed from the yards to the pastures as soon as practicable. The careful manager sees that these operations are carried out with as little knocking about of the flocks as possible.

### Jetting for Blowfly Strike.

A manager is fortunate these times if he goes through the year without having to dress the flocks for fly blow. In this connection we, in this Department, feel that something has yet to be discovered to prove more efficient than jetting, but at the time of speaking this method is the best to hand. A small power plant is recommended, fitted with a suitable nozzle. A pressure of 120 lb. to 160 lb. to the square inch, according to the length of wool carried, is required to get the ingredient used successfully on to the skin of the sheep.

Many proprietary mixtures, some with excellent qualities, are offered to the grazier. We find the use of arsenic and soda economical and effective up to a point. The proportions recommended are as follows:—7 lb. arsenic, 7 lb. washing soda, 100 gallons water; 1 lb. of soft soap may be added. The whole thoroughly dissolved. The nozzle should be held as closely to the sheep treated as possible.

### Sheep Licks.

The experienced manager will quickly detect a loss in condition in the flocks under his care. Apart from feed deficiency this loss in condition may be brought about by worm infestation. The remedies are at hand and quick action is necessary in the endeavour to check the spread of the pest. However, this loss of condition may be due to another cause—mineral deficiency in the pastures. This should be proved by analysis of the water supply, if artificial, and the ordinary grasses to which stock have access. Most Australian pastoral country is notoriously deficient in phosphates, and if this is found to be the case, it is the duty of the manager to ascertain what is wanted to make up the known deficiencies and to supply them in the form of a lick. Some good proprietary licks are offered for sale, but a prescribed lick for a certain set of circumstances is preferable, unless the proprietary lick happens to contain the ingredients wanted.

### Shearing and Marketing of the Clip.

The manager would be well advised to make early preparation for shearing. Too often this is left to the last day with consequent hurry and bustle. The machinery and engine should be attended to, the shed clean, yards and gates put in order, flooring battens fixed if necessary, down shoots put in order, and counting-out pens fixed for convenient working. All supplies necessary on the board for dressing wounds should be in readiness, the wool press overhauled and packs handy—in fact, a multitude of details which, if attended to in time, make for a smooth start.

A good manager recognises the necessity for an expert wool classer, and here let it be said that the payment of a good man should never exercise the minds of those finding the money. The right man earns his money and a handsome surplus for his employer.

### Finance.

It is essential that the successful manager should have some knowledge of local pastoral finance, and, further, he should be a good judge of stock values. A proposal founded on sound conservative lines is likely to meet with success, and although borrowing is not generally advocated, the industry is such to-day that outside finance enters largely into it. When money is available on satisfactory terms, one is justified in using same for specific purposes, provided the purchasing prices are not too high, and that one gives due regard to the capital value of the holding. Close touch should be kept with the local values of all stock. To buy well is a good deal half completed, and a fair proportion of the profits on the property come from a wise sale, either in the case of taking advantage of a temporary rise in prices or a sale made at a fair price with the specific idea of lessening numbers to the direct benefit of stock left on the holding. Small economies may be effected in management. Never buy a thing because it is cheap, unless there is direct use for the article. Repair at once what will cost you twice as much later on, and observe economy in management without depreciating efficiency.

# THE DAIRY INDUSTRY.

## THE DAIRY COMMITTEE SCHEME.

THE Dairy Committee scheme is a movement among the Local Producers' Associations of Queensland to group all members engaged in dairying activities. By distributing addresses on topics of interest to dairy farmers the scheme should result in making local producers' meetings more interesting and profitable to members.

The appointment to the position of leader of some member who has the welfare of fellow-members at heart will provide a link between the L.P.A. and the Dairy Branch of the Department of Agriculture and Stock. The leader's duties will be to act as official correspondent of the L.P.A., to make himself acquainted with departmental activities, to advise members in respect to such activities, and to generally lead debate and guide the committee's activities. In a large number of L.P.A.'s the secretary, no doubt, would be prepared to undertake these duties, in addition to his secretarial work.

The first address was forwarded to L.P.A.'s on the 25th May, and subsequent addresses have been and will be forwarded at regular periods. The fullest possible discussion is invited on all addresses submitted so that the maximum benefit may be obtained. Matters which arise out of the address may be referred by the leader to the Department for reply.

An effort is being made to have all leaders brought down to the Department and the Animal Health Station, so that they may become thoroughly conversant with departmental activities. The first quota is now attending a course of instruction in Brisbane.

The programme includes lectures on technical subjects and demonstrations at the Animal Health Station; also visits to a butter factory, cold stores, ice-cream works, piggeries, and the Brisbane Abattoir. It is hoped that the scheme will bring about closer co-operation between dairy farmers and the Department, which is working in their interest.

The scheme has become effective through the active support of the Dairy Cattle Improvement Board, which recognises it as a movement of considerable educational importance and the primary objective of the Dairy Cattle Improvement Act.

It is expected that as the scheme progresses other features of interest and benefit to dairy farmers will be included.

## SERVICES AVAILABLE THROUGH THE DEPARTMENT OF AGRICULTURE AND STOCK.

It has been the aim of the Department at all times, through the extension of its services, to strengthen the economic position of the primary producer and to maintain primary production on the soundest basis possible.

It must not be thought that the extension of services in this State involves experimentation. Every movement represents the adaptation of practices of other countries. Their effect on the economic life of the people is noted carefully and their development followed closely. The benefits likely to accrue to the people through their entire adoption or adaptation is the sole consideration of those who are charged with the framing of agricultural policy.

It is at times found necessary to give statutory authority to such movements to help those who will not help themselves, or to prevent those who will not see from jeopardising the welfare of the great majority. Unfortunately, we find such authority regarded with a sense of foreboding.

Let us get a fresh outlook of agricultural legislation and regard it merely as a collection of rules of our organisation, for that is exactly what it is. Let us examine those rules dispassionately, and we will find they meet with almost unanimous approval. Let us calculate the outgoings or the membership fee of our organisation and weigh it against the benefits to be derived, and we shall gladly contribute the small membership fee and feel grateful that we belong to such a well-regulated benefit society.

No doubt many dairy farmers are turning over in their minds the question of what benefits are available. Of course, the Primary Producers' Co-operative Associations and Marketing Acts under which the Commodity Boards, the Council of Agriculture, and our Local Producers' Associations are formed will come readily to mind. The fact that the association formed under legislative authority was responsible primarily for the acceptance of favourable marketing conditions throughout Australia

is well known to us all. Its benefits in returning millions of pounds to the farmers' pockets are, however, regarded with an equanimity which suggests that those benefits are not appreciated fully.

It now becomes a difficult matter probably to call to mind any other real benefits. This is due simply to a peculiar trait in human nature. We do not, as a rule, appreciate anything which comes to us without much effort. We value in life most highly the things that are difficult to obtain. We value the services for which we have to pay. We regard them only in proportion to their cost. Let us proceed to examine the various benefits which are available to members of local producers' associations who are following the dairying branch of production.

## ACTIVITIES OF THE DAIRY BRANCH.

### Production Recording.

Herd testing, or production recording, as it is now generally termed, is probably the most important feature in progressive dairy practice. In every dairying country in the world dairy farmers have realised its necessity and willingly pay large sums of money each year to secure the service. In New South Wales, where dairy practice is most near our own, from 140,000 to 180,000 cows are recorded each year, for which a fee of 6s. per cow is charged, and yet in our own State, where the service is absolutely free of cost, we find a paltry 10,000 or so cows recorded each year!

In every country in the world dairy farmers are required to contribute a similar sum for the service, and yet in Queensland we find they will not take advantage of it as a gift. Surely a serious indictment of our commercial instincts!

It has probably come to the notice of some members that production recording is now being conducted at butter factories. This has been rendered possible by the co-operation of the co-operative dairy associations, which are wholeheartedly supporting the movement towards the improvement of dairy live stock. The work is still being carried out by the Department, but as each centre grows and the numbers submitted justify the transference of the work to the factory, arrangements to that end are made immediately. While the local factory will be doing the testing of the samples, the production records will still be compiled in the Head Office.

### Rebates of Freight.

Inseparable from production recording in the breeding of better dairy cows is the use of bred-for-production sires. To encourage their use a further benefit has been made available. They may be railed within the State free of cost, providing the freight does not amount to more than £10, which is the maximum grant made. This is another gift, and yet we find that only nineteen farmers have availed themselves of it in the past eleven months in which it has been on offer.

### Literature.

Leaflets and pamphlets are available free of cost on all phases of dairying, representing the findings of science as applicable to modern dairy practices. The libraries of the world are thus opened to members.

### Animal Health Station.

At the Animal Health Station, Yeerongpilly, situated about 5 miles from Head Office, the free services of two veterinary surgeons, with the advantage of ready service on all stock ailments are available; it is expected that this service will shortly be doubled. In addition, there is a trained staff of bacteriologists to conduct investigatory work. The Station has given particular attention to the more common ailments among stock in Queensland, and prepares and distributes vaccines at cost price. For instance, in the case of mammitis, vaccine is supplied at 6d. per dose when ordering 100 doses.

Blackleg vaccine is distributed for £2 per 100 double doses, natural pleuro virus 3d. per dose, and blood for tick fever innoculation 6d. per dose. Now, these supplies carry the hall mark of Government guarantee, which means that they are prepared by the most modern scientific methods and at least as good as can be procured anywhere. Yet, what do we find? Large numbers of L.P.A. members prefer, apparently, to pay much higher prices elsewhere for similar commodities.

Apart from the foregoing monetary benefits which are available to the dairy farmer members of the L.P.A. organisation, we must consider the activities of the Department which are directed solely towards their benefit. In the dairy section, assistance is given in the producing and manufacturing sections directed towards the maintenance of a high standard of quality which can only benefit the producers.

In the agricultural section, demonstrations and trials are provided with grasses and methods of fodder conservation; moulds are loaned to farmers for the construction of concrete silos; while advice and literature are available on all phases of agriculture.

In the Entomological and Plant Pathological sections, literature and advice are available on insect pests and diseases in pastures and fodder crops, while extensive investigatory work is conducted to ascertain methods of combating such troubles which annually represent a terrific wastage in our primary wealth.

In the Agricultural Chemist's section, a highly trained staff co-operates with the other sections of the Department in conducting analyses of stock foods, soils, waters, fertilizers, pest destroyers, and general analytical work, and furnishes to primary producers valuable information for their guidance and protection.

It may be that some L.P.A. members have not been aware of the extensive services at their disposal, and are desirous of availing themselves of them in certain directions. If such be the case, they have only to write to the Department of Agriculture and Stock, William street, Brisbane, which may be looked upon as the headquarters of their organisation.

When seeking veterinary advice or supplies, letters should be sent direct to the Animal Health Station at Yeerongpilly to avoid any delay.

It may not be amiss at this stage to mention some pre-requisites to receiving prompt information, such as the manner in which samples should be transmitted.

Firstly, it is necessary to differentiate between chemical analyses and bacteriological examinations. In the former, a fairly large sample, say, a beer bottle full, is necessary for analysis, while in the latter only a small sample is required, such as an ounce or so. For bacteriological work, extreme care should be exercised to see that the bottle (and cork) used is itself free from any contamination, and for this purpose care should be taken to boil the bottles and cork before placing the fluid, be it water or milk, in it. Do not add preservatives to milk forwarded for bacteriological examination, as it merely destroys the micro-organic life which it is desired to be examined.

The name of the sender should be written on each parcel, so that it can be readily identified on arrival with letter of advice. Dozens of parcels are received daily.

If contagious mammitis in a herd is suspected, send a sample of the strippings from an infected quarter to the Animal Health Station, at the same time advising the number of cows it is desired to treat, should the examination disclose the disease.

If contagious abortion be suspected, a sample of blood is required for examination. After clipping away the hair with a pair of scissors, cut with a sharp knife across a large vein on the top outside of the ear, and allow the blood to flow direct into a scrupulously clean and perfectly dry bottle. Half a fluid ounce (one tablespoonful) of blood is required in an ounce bottle. The sample must not be shaken up, but left to stand undisturbed for an hour or two, in order to form a firm clot. Then pack and despatch the sample with as little delay as possible to the Animal Health Station. Decomposed samples of blood are of no use for the test. If the samples are cooled in ice before despatch, they carry very well.

Full directions for taking samples of soil for analysis or for forwarding insect specimens or plant life are in the hands of every L.P.A. leader.

The silo moulds are loaned free of charge, but borrowers are required to lodge a deposit of £3 as a guarantee for their return in good order and condition. Freight is also required to be paid from and to the departmental store. The Department has a set of 14-feet steel moulds weighing 17 cwt., and a set of 15-feet wooden moulds weighing 14 cwt. at present on loan.

In the case of mammitis vaccine, both the autogenous and stock vaccines are supplied from Yeerongpilly.

Members of local producers' associations are exhorted to make the fullest use of the services at their disposal, and it is believed that with the helpful co-operation of all concerned a steady and certain advancement in dairy practice, calculated to result beneficially to dairy farmer members, is assured.

[*In subsequent issues of the Journal, specific dairying problems and points in dairy practice will be discussed in popular form and simple language.*—ED. "Q.A.J."]

## CANNABILISM IN PIGS.

IT is unusual for sows to become cannibals and eat their own young, but it does sometimes happen. The food supply of the sow prior to and after farrowing is all-important, and on it very largely depends the health and wellbeing of sow and pigs. As far as is known, there is no disease which would definitely cause a sow to eat her pigs, but the trouble referred to as depraved appetite may be cited as the one possible cause. In some sows cannibalism is a habit formed at a previous farrowing and due to the sow being of such an excitable nature as to lose control of herself and temporarily become insane. In other sows there is an abnormal craving for blood, or for some food element not present in the ordinary rations.

Faulty diet is usually the cause of the trouble. It is possible that the mineral elements in the food may be lacking. Such elements as calcium, phosphorus, &c., are often insufficiently supplied. Many foodstuffs and pastures are deficient in mineral content; many grain foods are also deficient in protein flesh-formers; many pigs are fed an excess of fat-forming foods—maize, &c.—and an insufficient supply of flesh-formers. Lucerne and similar green foods, milk, &c., make up for deficiency of protein, while charcoal bone and meat meal, linseed meal, and a greater variety of food make up for mineral deficiencies. Sows that are allowed to graze over succulent nutritious pastures and that have balanced rations rarely, if ever, will be guilty of cannibalism. Sows that are kept in small yards and that become constipated and very feverish at farrowing time may become over-excited, and may temporarily lose self-control. Brood sows should not be allowed to eat the placenta or afterbirth, as occasionally partly formed or still-born pigs may be entangled in these tissues, and in this way the sow may be tempted to go further and eat the live pigs.

Some sows, particularly aged sows, become very heavy and clumsy, and overlay their pigs, and they then turn round and eat these and thus may be led to eat the others. Other causes are when the suckers, with very sharp black teeth, bite the sow's teats and udders and cause her to become excitable and snap at her young. She may draw blood, and in this way also become a cannibal. It is a good thing, where the litter fight and cause annoyance, to nip off the sharp black teeth of baby pigs, using a pair of tooth nippers or a small file.

Some breeders have found that by smearing the young pigs with a mixture of vaseline and bitter aloes, soon after they are born, trouble is prevented, particularly with a sow that has previously eaten her pigs. Other authorities advise giving the sow a good thick slice of salt pork between two slices of bread as a cure. Lack of green food and water, and lack of exercise and the feeding of unbalanced rations, is probably the cause in most instances.

In your case, we suggest reducing the amount of crushed wheat and adding more green food and mineral matter to the ration. If you do this, we shall be glad to have advice as to results, but would remind you that a great deal of time may be lost in carrying unprofitable sows. The purchase of fresh breeding stock would be productive of good and might pay a long way better than carrying on with the animals you have.

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**TO SUBSCRIBERS—IMPORTANT.**

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

# Answers to Correspondents.

## BOTANY.

*Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril White, F.L.S.*

### Dawson Valley Plants Identified—Sandalwood.

M.H. (Theodore)—

The specimens have been determined as follows:—

1. *Acacia fasciculifera*, a species of wattle.—The wood is said to be very durable in the ground. We have not heard the name Tulip Wood applied to it before. The name Tulip Wood in Queensland is generally given to *Harpullia pendula.*
2. *Cassia tomentella.*
3. *Citriobatus pauciflorus.*—This small plant belongs to the Pittosporum family (*Pittosporaceæ*). It is very common in parts of Queensland, mostly growing in scrubs about 50 to 100 miles in from the coast. It is not known to possess any poisonous properties.
4. *Abutilon indicum.*
5. *Santalum lanceolatum*, commonly known in Central and Western Queensland as Plum Bush or Scent Wood.—This wood is exactly the same as the Sandalwood exported from North Queensland. For many years we were always under the impression that it was only the Northern trees of this species that possessed scented wood, but during the last two or three years we have found that the heart wood of big trees in the more Southern parts of the State, even as far South as Dalby, possesses a strong, very pleasant, sandalwood odour. The wood from younger trees and the sapwood seem to lack the typical odour altogether.

   Send specimens of what you call sandalwood, but we think there is little doubt that this is *Eremophila Mitchellii*, a small tree common in Western Queensland and extending to New South Wales. In the latter State it is commonly known as budda. The wood is very pleasantly scented, and is occasionally exported as a second grade sandalwood under the name of rosewood. It is used in the West for fencing posts and as a fuel. We have recently found out, however, that the wood is likely to have considerable value for oil extraction. Wood distillation, however, is rather different from the distillation of leaves such as in the eucalyptus oil industry. It requires an elaborate plant, and if the industry becomes established the wood will have to be sent to some larger centre such as Brisbane or Sydney for distillation. Sandalwood oils are used as a fixative in the manufacture of soaps, tooth pastes, &c., and the quantity used industrially is far greater than the quantity used medicinally.

   We were interested in the notes you made on the specimens you sent, and would always be pleased to have any further observations on the specimens from your locality.

### Swamp or Native Millet.

T.H.P. (Nambour)—

The specimen is *Echinochloa Walteri*, sometimes known as Swamp Millet or Native Millet. It is quite a valuable grass in wet situations. The grass is worthy of propagation, but seed is not stocked by nurserymen. If you desire to increase it, however, you should have no difficulty in doing this from seeds and cuttings from your own plants.

### Bowstring Hemp.

A.F. (Cordalba)—

The specimen is Bowstring Hemp, *Sansevieria zeylanica.*—This is an excellent fibre plant, but has never been a great commercial success. We should say it would be an excellent plant for the manufacture of high-grade paper, but do not know that it is used for that purpose to any extent. There are many fibres that can be used in the manufacture of high-grade paper. If you write to the Curator, Technological Museum, Harris street, Sydney, New South Wales, he may be able to tell you whether there is any market for this fibre at the present time, and if there is any demand for it for paper-making.

**Milk Vine. *Salvia Coccinea.***

H.D. (Rathdowney)—

The vine is Milk Vine, *Marsdenia rostrata,* moderately common in parts of coastal Queensland and Northern New South Wales. It has been definitely proved by feeding tests to be poisonous to stock, and its eradication is therefore recommended.

The red flowering herb or small shrub is *Salvia coccinea,* a native of tropical America, now a naturalised weed in many warm countries. It is fairly common in coastal Queensland and has the reputation of causing abortion in stock, but this has not been verified by feeding tests. However, in view of the known use of oils of its allies as abortifacients, it is just as well to look on the plant with suspicion. Personally, we rather doubt stock would eat it in sufficient quantities to cause trouble.

**Paraguay Tea.**

H.F. (Bundaberg)—

The plant advertised as Hervea is the Paraguay Tea, *Ilex paraguariensis,* a native of parts of the Argentine, Southern Brazil, and Chile. It occupies in many South American countries the same position as ordinary tea does in Australia, and the amount collected is very considerable. It has been exported abroad during the last few years, and many claims have been made for it. The Department has introduced seeds of it on occasions, but no success has been achieved in raising them.

**Tie Bush. Chinese Burr. Rattlepod.**

C. (Bundaberg)—

No. 1—*Wikstroemia indica,* sometimes known as Tie Bush on account of the fibrous nature of the bark. This plant has been suspected of poisoning stock at different times, but feeding tests were carried out a few years ago at the Animal Health Station, Yeerongpilly. At the end of about a fortnight's feeding the animals were in a very emaciated condition and suffered from bloody scours. When taken off the Wickstroemia, however, the animals gradually recovered normal health. It is doubtful if stock would eat sufficient of the plant under normal circumstances to cause death. The berries are poisonous, and a recent death of a child at Nambour, it seems, can be fairly definitely traced to this source.

No. 2—*Triumfetta rhomboides,* Chinese Burr. A common weed in Queensland, also has a wide distribution in tropical countries. It is not known to possess any harmful or poisonous properties.

No. 3—*Crotalaria Mitchellii,* Rattlepod. Several members of the Rattlepod genus have been definitely proved, both in Australia and abroad, to be poisonous to stock. No feeding tests have been carried out with the particular one you send, but it has several times been suspected, and of the plants you send we are inclined to look on this one as the most likely cause of the trouble.

**Blue Couch.**

R.H.M. (Pimpama)—

So far as we know, seed of Blue Couch is not obtainable through the ordinary commercial channels. The general practice for lawns, of course, is to lay down from turves, small rooted pieces, or, in damp weather, even from ordinary lawn clippings. The only test so far carried out by the Seeds Branch of the Department of Agriculture and Stock yielded 5 per cent. fertility. In spite of this, however, we think the plant must be spread by seed, because its spread has been so phenomenal during the last ten years; and it must be carried from district to district by seeds, most likely seeds passing through stock. If you want to sow from seed we think you will have to arrange to gather it yourself, but in damp weather the plant spreads so rapidly from roots that we think you will find this in the end the most satisfactory method, though it may be a bit expensive in the beginning. Blue Couch is undoubtedly a valuable fodder, though, of course, it has not the carrying capacity, nor do we think the milk-producing properties of a grass such as Paspalum, but it will grow where Paspalum will not thrive. Farmers with Paspalum paddocks may be a bit afraid of it, because it is so vigorous that when once it gets a hold it will crush out all other grasses and herbage, and will even, in time, conquer Paspalum—that is, where the Paspalum is closely fed or especially overstocked.

**Setaria palmifolia.**

E.W.H. (Hillview)—

*Setaria palmifolia,* a native of India, now much cultivated in tropical and subtropical countries as an ornamental grass. It is grown fairly extensively in Queensland gardens, and here and there has run out and become half naturalised. It is generally grown purely for ornamental purposes, and we have little or no information on its fodder value, but if you say that stock are eating it readily it should be worth while propagating. It grows rapidly and is easily propagated from division of the older plants. We have not heard a common name given to it.

**Mimosa Bush.**

F.I.T. (Yeulba)—

The specimen of Mimosa Bush is the ordinary Mimosa of Western Queensland, *Acacia Farnesiana.* Reports on this are rather conflicting, but most graziers who have spoken to us about the plant say that in spite of its prickly nature sheep will feed readily on it. Analysis of the leaves and young shoots shows the plant to be undoubtedly nutritious. Others state that the plant is worthless. It may be a matter of locality. We do not know. It seems to us, the only method of eradication of the plant is by brushing and subsequent burning. Burning, of course, should be done before the plants set seed, as otherwise the fire, especially if followed by rain, would assist germination.

**Hop Bush. Kangaroo Apple. Rag Weed.**

E.A.T. (Chinchilla)—

1. *Dodonæa viscosa,* Hop Bush, generally regarded as useful food for stock during dry periods, though not one of the best fodder trees or shrubs.
2. *Solanum aviculare,* Kangaroo Apple. This plant is definitely poisonous to stock. Usually speaking, it is left untouched, but quite recently some deaths of sheep were directly traceable to this plant.
3. *Pterocaulon cylindrostachyum,* a common weed. The only local names we have heard applied to it are Rag Weed and Stink Weed—names also given to other plants in Queensland. It is not known to possess any poisonous properties, but is apparently more or less useless as a fodder. It is in no way allied to Wild Mint.

**A Useful Fodder Plant *Hedysarum coronarium* Sulla.**

C.B.D. (Corfield, N.Q.)—

*Hedysarum coronarium,* Sulla has been introduced into Australia at odd times but never seems to have taken on to any extent, due, no doubt, to its being overshadowed by lucerne, but there is no doubt that there would seem to be a future for it in dry, rocky places where lucerne will not thrive. It is a native of Southern Italy, and is much cultivated in the Mediterranean regions—Southern Italy, Sicily, Malta, Algeria, &c.—where it is treated as an annual or as a perennial like ordinary lucerne, but in the more northern parts of Italy, where the winters are severer, it is treated strictly as an annual. We think that in Australia it would probably do best somewhere on the coast, say, between Brisbane and Gympie, but as it is said to stand a good deal more tropical conditions than ordinary lucerne, it is worth trying in the North. In Australia, it has been grown to a limited extent in as cold a place as Glen Innes, New South Wales, where it was found to make good growth during the winter, spring, and early summer, but did not set seed. We do not know how much seed you have, but if you could spare us a pinch we would be pleased to have it, and if you could spare another pinch and send it to Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Townsville, the favour would be much appreciated.

**Balsam Apple.**

J.A.O'N. (Gayndah)—

The specimen is the Balsam Apple, *Momordica balsamina,* a vine widely spread over the tropical regions of the world and much cultivated on account of its ornamental foliage and fruits. It is not known to possess any poisonous or harmful properties. A larger species, *Momordica charantia,* is cultivated as a vegetable by the Indians and Chinese. The fruit is soaked in salted water for some hours to rid it of its naturally bitter taste. It is then cut up and fried or used in curries.

# General Notes.

### Staff Changes and Appointments.

The following transfers of officers in the Department of Agriculture and Stock have been approved:—W. G. Hancock, Agent, Banana Industry Protection Act, from Pomona to Currumbin; D. McLaurin, Agent, Banana Industry Protection Act, from Gympie to Wynnum; C. N. Morgan, Inspector, Diseases in Plants Acts, from Thulimbah to Brisbane.

Messrs. C. Schindler and J. H. Horsley have been appointed Inspectors under the Diseases in Plants Acts, the latter also an Agent under the Banana Industry Protection Act, and will be stationed at Thulimbah and Pomona respectively.

Additional Cane Testers for the present crushing season have been appointed, and these are Misses J. Orr, M. T. Smith, E. Christsen, J. O'Flynn, D. Marles, and Messrs. T. P. Brown, L. Chadwick, J. Howard, and R. D. Woolcock, who will be stationed at the Bingera, Fairymead, Isis, Maryborough, Millaquin, Gin Gin, Moreton, Rocky Point, and Mount Bauple Sugar Mills, respectively.

Additional Assistant Cane Testers for the present crushing season have been appointed, and these are Misses T. M. Payne (Bingera), D. Aldridge (Maryborough), V. Page (Millaquin), and E. Mullin and P. Southwick (Moreton).

Mr. E. H. Gurney, Senior Analyst, Agricultural Chemical Laboratory, has been appointed Agricultural Chemist, Department of Agriculture and Stock.

Mr. N. G. Cassidy, Research Assistant, Bureau of Sugar Experiment Stations, has been appointed Analyst, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

The Officer in Charge of Police, Home Hill, has been appointed an Acting Stock Inspector.

The following have been appointed members of the Stallion Boards as hereunder specified:—

The personnel of the Wide Bay District Stallion Board and the Burnett District Stallion Board is the same, and consists of—Messrs. A. F. S. Ohman, M.V.Sc., Chairman (Government Veterinary Surgeon), G. Elliot, and R. J. F. O'Bryen. East Moreton District Stallion Board—Messrs. J. C. J. Maunder, B.V.Sc., Chairman (Government Veterinary Surgeon), W. Frood, and S. R. Watson.

The resignation of Mr. H. Crollick as Honorary Acting Inspector of Stock at Gradule has been accepted, and Mr. F. J. McGovern has been appointed Honorary Acting Inspector of Stock at Gradule in place of Mr. Crollick.

The following have been appointed members of the Central Coast District Stallion Board:—Mr. J. C. J. Maunder, B.V.Sc. (chairman), J. Sprott (Talgai West, Ellenthorp), and W. C. Jeffrey (Miriam Vale).

Mr. W. G. Merrill, Finch Hatton, has been appointed Canegrowers' Representative on the Cattle Creek Local Sugar Cane Prices Board, vice Mr. E. A. Taylor, resigned.

Mr. K. R. Hack, Nerang, has been appointed an Honorary Ranger under the Native Plants Protection Act.

### Peanut Board.

The following nominations have been received at the Department of Agriculture and Stock in connection with the election of a member for each of the Districts Nos. 1 and 2 of the Peanut Board:—District No. 1 (Wienholt and Nanango)—Charles Frederick Adermann (Kingaroy), Gotfried Martinus Pedersen (present member) (Wooroolin). District No. 2 (Central Queensland)—Norman Albert Nielsen (Milman) (returned unopposed).

An election will be necessary for District No. 1 (Wienholt and Nanango) and voting papers will be sent out in due course. The date fixed for the return of the papers is not later than the 23rd August.

### Dairy Cattle Improvement Act.

An Act to provide for the licensing of bulls and the improvement of dairy cattle was passed last Session, and a Proclamation has been issued bringing this Act into force as from the 12th January, 1933. Regulations have also been issued under the Act, and these contain a Schedule of the prescribed Forms of Application and Certificates of Licenses for bulls.

**Separate District Executive for Tully.**

Executive approval has been given to the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts amending those Acts by providing that the Tully River Central Sugar Mill Suppliers' Committee shall, in future, be deemed to be the Tully River District Cane Growers' Executive. At present, the Tully sugar-growers are affiliated with the Innisfail District Cane Growers' Executive, and following upon requests from growers concerned and others, the above action has been taken to form a separate District Cane Growers' Executive for the Tully growers.

**Pineapple Levy.**

Executive approval has been given to the issue of Regulations under the Fruit Marketing Organisation Acts, empowering the Committee of Direction of Fruit Marketing to make a levy for the purposes of the Acts on all pineapples marketed for the year ending 19th August, 1934.

These Regulations are similar to those in force last year, and provide that the levy shall be payable by growers on the basis of the quantity of fruit marketed, and shall be 1d. per case on all pineapples sold, or consigned, whether by rail, road, or boat, to factories; 1s. 4d. per ton, with a minimum of 1d., on all pineapples sold, or consigned by rail to any agent, person, or firm in Queensland, other than to a factory; ½d. per case, with a minimum of 1d., on all pineapples sold, or consigned otherwise than by rail to any Queensland railway station to any agent, person, or firm, except a factory. In instances where sold loose, at the rate of ½d., with a minimum of 1d., for twenty-four smooth-leaf or forty-two rough or Ripley pineapples, as being equivalent to a case of fresh pineapples.

The levy on all pineapples railed from any Queensland railway station (other than Toowoomba, Townsville, Rockhampton, Roma Street, Woolloongabba, Brunswick Street, South Brisbane, or Central Stations) to any other Queensland railway station may be collected by the Railway Commissioner to the extent of 1s. 4d. per ton, with a minimum of 1d.

Except as provided, the levy in the first instance shall be collected—

(1) On all pineapples sold, or consigned to factories whether by rail or otherwise, by the C.O.D. to the extent of 1d. per case;

(2) On all pineapples sold or delivered otherwise than by rail to any Queensland railway station to any agent, person, or firm, other than a factory, by such agent, person, or firm, at the rate of ½d. per case, with a minimum of 1d.

In the case of agents or persons other than the C.O.D., or the Railway Commissioner, the levy shall be collected by means of levy stamps obtainable from the head office of the C.O.D., Brisbane, which shall be affixed to account sales.

The sums raised by the levy shall be expended by the C.O.D. in the interests of the pineapple fruit section of the industry.

**Canary Seed Board.**

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, giving notice of intention of the Governor in Council to extend the operations of the Canary Seed Pool until 31st May, 1936. The present pool will expire on the 28th February, 1933.

Provision is made in the Order in Council for the lodgment of a petition signed by not less than 10 per cent. of the growers of canary seed, requesting that a poll be conducted on the question of whether or or not the pool shall be extended from 1st March, 1933, to 31st May, 1936. The closing date for the receipt of petitions is 13th February, 1933.

**Introduction of Poultry from Other States.**

Present regulations governing the introduction of poultry into Queensland necessitate—(1) a declaration by the owner; (2) a certificate of health by a Stock Inspector; (3) a certificate by the Chief Veterinary Surgeon of the State from which the birds are being introduced; and (4) a permit signed by the Poultry Expert of the Queensland Department of Agriculture and Stock. However, an amendment of the regulations under the Diseases in Poultry Act has been approved which will render it unnecessary, in future, for an owner of introduced poultry to deliver to an inspector on arrival at the place of introduction a permit to import issued by the Poultry Expert of the Department of Agriculture and Stock in Brisbane. This amendment has been made, as Newcastle Disease is under control in the South, and the action would facilitate the movement of birds between States.

# Rural Topics.

### Apples for Export.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock), on his return from a visit to the Stanthorpe district, remarked that the Granite Belt had yielded a record crop of fruit during the past season, and as a result the export of apples to the United Kingdom had amounted to 32,000 cases for the year, or an increase of 150 per cent. over the previous season, when 13,000 cases were exported. "Queensland is just opening up an export trade in apples," continued Mr. Bulcock, "and it is very encouraging to note from a report I have just received from the High Commissioner's Office in London, through the Department of Commerce, that the quality of the fruit from this State on arrival in England was exceptionally good, and compared with the best from other dominions. Of course, in the initial stages of a venture such as this some defects are bound to be noticed, and it appears it will be necessary to adopt a tighter pack in future shipments.

"Some shrivelling was noticeable in the case of the Jonathan variety, due probably to leaving the fruit exposed to the hot sun after picking. These are matters, however, which can with care be easily overcome, and with the exercise of this little extra attention there should be a very satisfactory future for the apple export trade."

### Sunlight Butter.

British butter merchants will not give as high a price for Australian butter as they give for Continental or Maoriland butter. The Briton prefers the taste of Danish or even Russian butter to that from the Commonwealth. But there is another and a far better reason than mere idiosyncrasy in palate why Australian butter should not merely start level but be preferred to the products of the foggy north. Sir Arbuthnot Lane, president of the New Health Society, repeatedly stresses it.

Our butter is the product of sunshine. Our cows live in the full light; our grasses develop and flourish under the brightness of blue skies. This is no mere sentimental bunk; the sunlight is a material asset, and, if properly exploited by Australian publicity men, is calculated to place the price of our butter above that of Danish.

Sunlight dredging the grasses and the cows during their whole existence means that the butter they produce is rich to saturation-point in the vitamins which are essential to human health. A pound of Australian butter may not suit the British taste as a pound of Danish butter does, but scientific investigators will say that it contains a much greater content of the vitamins which make for body-building.

While the search for a butter which will appeal to the English palate should not be relaxed here, the more important point of the excess food value of the Australian product should be pushed before the British consumer. . . . —"The Bulletin" (Sydney).

### Picking a Piggery Site.

Some important points should be considered when picking a site for a piggery. In the first place, drainage should be effective. The site should have a gentle slope, without being steep, and if the aspect is to the east, it will be so much the better. The drainage should be of a surface kind, the result of the fall or slope, and should not depend upon underground drains, which are apt to get choked up and can never be kept in the same sanitary condition as those to which the sunlight has access.

If there is a piece of rough ground on the farm that is conveniently situated and otherwise satisfactory it may be very suitable for the piggery. Regard must be had, too, for the position of the residence, for if the prevailing winds carry the smell of the piggery to the dwelling, one or other will probably have to be moved quite soon.

Light, absorbent, sandy loams are preferable to stiff clays or soils with a clay subsoil. Clays are apt to become saturated with offensive matter in time, and thus to give rise to unhealthy conditions, especially during wet weather. Where there is a good fall, however, clays are less objectionable.

The buildings should be constructed so as to admit plenty of sunlight. There is no disinfectant so cheap or effective as sunlight, and whatever the fall of the land the piggery must be arranged so as to get the maximum amount of it. It is also essential that the buildings be closed on the side from which bad weather mostly comes, and should face the good weather quarter.

**Potato Improvement in the South.**

At a time when so much is being said regarding the condition of Australian agriculture, it is encouraging to observe at least one evidence of its vitality—that represented by the operations of the New South Wales Agricultural Bureau. Here is an association of producers concerned, not only with the problem, "What is the matter with farming?" but with the much more pointed question, "What is the matter with the farmer?" Improvement of farming methods by mutual education is its primary objective, and in every part of the State there are signs of its success in this direction. It may fairly be said that a district could offer no better proof of the sincerity of its interest in rural progress than that afforded by a branch of the Bureau.

Branches are carrying out a variety of valuable projects. An interesting example is the potato improvement work in the Batlow district, thus described by the Hon. Secretary, Mr. J. E. Dodds, in a recent issue of "Bureau Record":—

"Some six years ago the executive of the Batlow branch realised that potato-growing as an industry in the district was falling back. Investigation showed that this was mainly due to the 'running out' of seed, with resultant low crop returns. Potato crop-growing competitions were seriously taken up as a means towards the improvement of these conditions, and a committee was appointed from the branch to endeavour to educate the growers as to the correct methods of avoiding this 'running out' as well as of bringing the best varieties back to a prolific habit.

"It was quickly realised that success in potato-growing could only be achieved by strict attention to three aspects of production—viz., seed selection, soil fertility, and cultural methods.

"Dealing with their problem under the first of these heads, the committee at first thought that the introduction of seed from outside districts would suffice. This was done, but results were disappointing. They then realised that the grower himself must improve his seed by rigid selection.

"The potato consists mainly of starch, and since vigour and production of leafage are the main factors governing starch content, any conditions unfavourable to these functions are likely to cause failure in the crop. Many of the recognised diseases, particularly those of the virus type, seriously interfere with vigour and leaf production in plants, and there were also found in every crop certain types of plants not suffering from the, at any rate, commonly recognised diseases, which were seriously deficient in vigour and leafage. This led some growers to definitely select plants from the growing crop for certain qualities, such plants being marked in the crop by a stake during the growing period.

"The qualities looked for were:—(1) Freedom from the virus diseases leafroll and mosaic (and lately an effort has been made to reduce the incidence of rhizoctonia, not so much as a tuber disfigurement as a factor seriously affecting germination and the vigour of the plant during growth); (2) general vitality of the plant, luxuriance of top and resistance to adverse conditions; (3) good yield and quality of tubers when dug, and conformity of type of plant and tuber to the standard of the variety. The produce of plants filling these requirements is bagged separately and used for the grower's own seed or 'mother' plot. When sown the following season these seed plots are carefully rogued of all undesirable plants, and the whole of the produce of these plots is used by the grower himself for seed for the commercial crop in the following season. This work has contributed perhaps more than any other factor toward the improvement achieved so far.

"The stimulus of competition has engendered a good deal of private experiment among our members in manuring and feeding the potato crop. There is considerable variation in the chemical and physical characteristics of the soils within the district, and to date no general formula is acceptable to all our growers—nor is there likely to be for the above reason. Whilst in some instances the use of superphosphate alone is doing all that can be asked, there is a general tendency toward the use of sulphate of ammonia in combination with various quantities of superphosphate. All are now agreed, however, on the importance of humus as the basic requirement of the potato in this district. Means are taken to replenish this content in soils which have been depleted by continuous cultivation. In some instances such reconditioned soils are giving better results than new ground.

"Careful preparation and handling of the soil are essential to success. This district is specialising in seed production, and for this purpose a moderate-sized tuber is the objective. Close planting, both in the rows and between them, is becoming common. It has by no means been proven that this practice will give the biggest yields in all seasons, and it would certainly be fatal in other than thoroughly prepared land. To this end deep ploughing in the winter is in order, permitting the absorption of the heavy winter rains obtaining in this district and also any heavy thunderstorm

rains in the summer during the growing period, which provide a good storage from which the plants can draw moisture during a dry spell. The rows being very close prevents the use of the scarifier in the crop, but it has been found here that the use of the light harrow from the time the plants are above ground up to flowering time keeps the weeds in check and effectively conserves moisture. From this stage onward the plants themselves tend to smother any later weeds and prevent any serious evaporation from the soil.

"The committee in charge of the work and the growers generally, whilst encouraged by the improvement in both the cropping and the quality of the product, as well as the general increase in the yield per acre in the district even with growers outside the branch, fully realise that whilst they get the variation in yield in the individual plants adjoining one another obtaining to-day, they have only started a very long climb toward more satisfactory production in this crop.

"A valuable result of the work here has been the initiation of the seed organisation as a branch of our local co-operative society, and it is handling an increasing output of certified potato seed to the satisfaction of both seller and buyer."

## An Effective Formula for Poisoning Green Timber.

An effective way of rapidly killing green timber and at the same time reducing suckering to a minimum is to frill the tree and poison it by pouring into the frilling a solution of sodium arsenite. The best time to carry out the operation is when the sap flow in the tree is ceasing, a period which varies in different districts, but as a rule commences about February.

A useful formula for quick and effective work in all kinds of timber is arsenic, 1 lb.; washing soda, 1 lb.; or caustic soda, ½ lb.; water, 3 gallons. Arsenic—the ordinary white arsenious oxide of commerce—is not soluble in water to any great extent, so that soda, either the ordinary washing soda or caustic soda, has to be used to dissolve it. When large amounts of the solution are required, washing soda will be the cheaper, but for small quantities of solution caustic soda will possibly be found the handiest.

When preparing the solution, whether caustic soda or washing soda is used, first dissolve the soda in a convenient amount of water, using heat, if desirable, to hasten the process; then slowly add the arsenic, which has been previously made into a thin paste, stirring all the time; place on a strong fire, and after it has come to the boil, allow it to remain boiling for at least half an hour; stir from time to time, and be careful to stand on the side away from the fumes, as they are poisonous and are apt to cause sickness. When the arsenic is thoroughly dissolved, the solution may be made up to the required bulk by adding the remainder of the water, either hot or cold.

Frilling the tree consists of a succession of downward axe cuts completely round the trunk, each cut well overlapping the adjoining ones, so as to leave no unsevered section of bark up which the sap can flow. Frilling alone would ultimately kill the timber, but the poison does it in a fraction of the time; in fact, trees have been killed in a few days. The cuts must be through the bark and well into the wood proper, and as close down to ground-level as it is convenient to cut them consistent with the shape of the tree—say, from 6 to 10 inches up. For trees of 4 feet in diameter, pour about a quart of solution into this frilling right round the tree, using an old teapot or kettle, as the spout makes pouring easy, and less is wasted by spilling. Smaller trees naturally need less solution. Saplings may be cut off low down, and the solution dabbed on with a swab-stick to kill and prevent suckering.

It is very important that the frilling and the application of the poison be consistently and thoroughly carried out if good results are to be looked for.

There need be no fear of stock being poisoned by eating the fallen or dead leaves from poisoned trees, for with the comparatively small quantity of solution used the likelihood of leaves absorbing any free arsenic is very remote; but there is some danger to stock grazing on areas frilled and poisoned, and it is desirable to keep all stock off for three or four weeks, when all possible chance of danger will have disappeared.

Although arsenite of soda is obtainable as such from drug merchants, its use when procured in that form cannot be recommended for the poisoning of green timber, as it is most irregular in its arsenic content. Prices for arsenic, caustic soda, and washing soda are apt to alter frequently. It is, therefore, advised that when a considerable area is to be treated, one or other of the wholesale chemists be written to and quotations obtained.

Arsenic pentoxide may be substituted for the arsenic and soda. It is soluble in water, but as it has a corrosive action, wooden or earthenware containers will be required.

Although the method described kills the tree much more speedily than frilling alone, the usual drying out must take place before the tree can be burnt.

# The Home and the Garden.

## OUR BABIES.

(Issued by the Queensland Baby Clinics.)

*Under this heading we issue a monthly series of short articles dealing with the welfare and care of babies, in the hope of increasing their health and happiness, and decreasing the number of unnecessary deaths among them.*

### PLANNING THE CHILDREN'S MEALS.

*The following instructions issued by the New Zealand Society for the Health of Women and Children should be useful to Queensland mothers:—*

PLANNING the children's meals is not much extra trouble. It is more a matter of method and management than actual work—more head than hand work.

If the general family meals are plain and nutritious the same food should be suitable for the older child.

Where the small child's dinner has to be cooked wholly or partly separate from the general meals, steaming is a most economical and convenient method of cooking. A steamer may be bought to fit saucepans of standard size, and is a purchase which will pay for itself many times over in different ways. A potato, a piece of cauliflower, a young carrot, or whatever vegetables are the order of the day may be cooked together in the steamer, having been slightly sprinkled with a little salt. There they can go on cooking merrily over boiling water, or perhaps over something which is cooking for the family meal. Cooking in this manner allows the vegetable to retain the mineral salts which are so necessary for the maintenance of good health and nutrition. Cooking vegetables in the ordinary method by boiling allows these valuable substances to be more or less lost in the water used. All that is needed is a little common-sense experimenting in regard to the length of time necessary for thorough cooking of various foods. Generally speaking, when steaming food, about half as long again as for ordinary boiling is required, but constant watching is not necessary, and a longer time does not mean spoiling of the food in case of unforeseen delay. Fish may also be cooked in the steamer—say, placed in a saucer with a tablespoonful of milk, a tiny dab of butter, and a pinch of salt. This can be placed in the steamer beside the potato or other vegetable.

If a joint is being cooked for the family dinner it is easy to select and save a specially tender little piece for the child, but if it is preferred not to give meat, the gravy or good stock should be saved. Made gravy consisting of flour only slightly cooked is not suitable for children. If sauces are being used with fish or vegetables they must be very well cooked and free from lumps.

Of course, baking in the jacket is the ideal way of cooking good potatoes, as it is just under the skin that mineral and vitamins are found. If the oven is in use many foods may be most satisfactorily cooked "en casserole"—that is, in a well-covered dish or pot of earthenware or "pyrex." Meat, fish, or chicken are commonly cooked in this way, but it is not so generally realised that fruits and vegetables can also be excellently cooked in the same way. Vegetables should be sliced on top of meat, or they may be cooked along with a very little water, a sprinkle of salt, and perhaps a small piece of butter. Fruit should be sliced and placed in the dish with a little water and sugar if necessary. The casserole should be placed in a hot oven at first, then a slow oven is quite suitable, when a milk pudding may be cooked at the same time.

Choose the children's food carefully from the following list, so that they have some of each group every day:—

*Group I.*

Fresh, uncooked fruits—Oranges, apples, pineapples, bananas, &c.; lemon drinks.

Salad—Lettuce, tomatoes, &c.

Green vegetables—Spinach, silver beet, cabbage, French beans, &c.; not cooked too long, nor with too much water, and never with soda.

Other vegetables—Carrots, pumpkin, green peas, &c.

*Group II.*

Milk, eggs, cheese (grated for young children).

Meat, chicken, fish, fish roe, tripe, liver (or lamb's fry).

Dried peas, beans, and lentils.

*Group III.*

Whole wheatmeal and oatmeal.

Wholemeal bread (if white bread is eaten, give a tablespoonful of cooking bran daily).

Potatoes and sweet potatoes. Rice, sago, &c.

Honey, golden syrup, sugar, jams, in moderate quantities.

Dried fruits—Raisins, dates, prunes, &c.

*Group IV.*

Butter, cream. Beef or mutton dripping.

Bacon is not so good, but may be given sometimes.

Each child should, if possible, have one pint of milk daily, or at least half a pint. Give some uncooked fruit or green vegetables every day. Do not waste your money on fancy foods.

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## CABBAGES.

To grow cabbages well plenty of manure should be used. There is no manure to which this crop responds so well as animal. For heavy lands horse manure, and for light soils cow or pig are respectively the best when they can be obtained. If the soil is of a poor quality, dig the ground two spits deep, and put a good layer of manure between the two spits. This is especially necessary in the case of autumn or summer crops, which have to stand a dry spell. Spring cabbage—that is, those that are planted in the autumn for use in the spring—do well if planted on ground that has been well worked and manured previously for peas or onions, and on such ground cabbages can be planted without any fresh manure being added. Of other manures lime is an important factor in successful cabbage culture; it is chemically and mechanically beneficial to the soil and the cabbage tuber. It should be applied at the rate of about 2 lb. to the square yard, and is particularly necessary to heavy soils and those rich in humus. Superphosphate at the rate of 2 oz. to the square yard is good, but should not be applied at the same time as lime or to soils that are infected with club root. When the crop is nicely established, apply 1 oz. of sulphate of ammonia to heavy, damp land, or 1 oz. of nitrate of soda per square yard in the case of light or sandy soil. Nitrate of soda is a splendid fertiliser for the cabbage family. When especially fine heads are required, water the plants once or twice during the growing season with the following mixture:—1 oz. of iron sulphate and 2 oz. of sulphate of ammonia dissolved in 1 gallon of water.

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## KITCHEN GARDEN.

Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of this, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be a great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly-dug beds. What the action of salt is is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders

the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada beans, providing a trellis for them to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinnach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

## THE HOME VEGETABLE GARDEN.

Fresh vegetables, especially vegetables containing vitamins, are essential to good, robust health, and medical men are now advising people to "eat more vegetables."

The growing of vegetables not only means a saving of money, but educates the children by inculcating a desire to have their own gardens in later life, and so help to keep down the costs of living.

Vegetable-growing is not only a healthy occupation, but it also provides exercise and recreation. In the suburbs it has a tendency to keep young people contented at home, and to trouble less about going to horse races and places of gambling. With country people who, perhaps, are less in need of exercise, gardening is a delightful hobby.

It enables private gardeners to improve the strains of vegetables by a careful selection of seed, much in the same way that a flockmaster improves his sheep; and much satisfaction, and, not unusually, generous reward, are to be gained from this work.

The home garden enables the testing out, in a small way, of the newer varieties of vegetables, which work is not always possible, or, if it is possible, not payable with the professional or commercial gardener. The amateur gardener will find this work both fascinating and health-giving.

## HERBS FOR THE KITCHEN.

Given suitable soil conditions, the various culinary herbs (sage, thyme, marjoram, mint, &c.) are easily cultivated in Queensland, and every garden should have at least sufficient plants for home requirements. Commercial production, too, presents possibilities, especially of those herbs which are sold in a green state, the chief of which are mint and parsley. During the winter months a demand exists for both these herbs. Under cool conditions little growth is made, and some growers have therefore resorted to production under glass, especially in the case of parsley. The increased popularity of peas as a vegetable has tended to the more extensive use of mint at all seasons of the year. Owing to the necessity for freshness in the product, the metropolitan market for mint and parsley is supplied by suburban growers.

There is some household demand for dried herbs, which are used also by butchers for the flavouring of sausages. The consumption is very limited, however, and those contemplating commercial production are therefore advised first to make sure of a market for their produce.

For the successful cultivation of herbs a rich, loamy, friable soil is necessary, and a plentiful supply of water must be available during their growing period. Wherever possible, the soil should be dug to a depth of 9 to 10 inches and should be well supplied with well-decomposed stable manure. As the seeds of all these herbs are fairly small, it is necessary to cultivate the soil to a fine tilth.

# Farm Notes for September.

WITH the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghum, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Tobacco and peanuts; plant sweet potatoes, arrowroot, sugar-cane, and cow cane (preferably the 90-stalked variety), and in those districts suited to their production yams and ginger. Plant out coffee.

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# Orchard Notes for September.

## THE COASTAL DISTRICTS.

SEPTEMBER is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the foregoing has been written mainly in respect of citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting, all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, two to three eyes are left spaced around the butt, and surplus ones being removed, the top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each "plant" being covered by a few inches of soil immediately) beetle-borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

When necessary, manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash —two of the former to one of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared —viz., brought into a state of perfect tilth to a depth of at least 1 ft.—more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure; which should, however, contain no superphosphate, bonedust or Nauru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

WHERE not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts, which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

## QUEENSLAND SHOW DATES, 1933.

Royal National: 7th to 12th August.
Crow's Nest: 23rd and 24th August.
Home Hill: 1st and 2nd September.
Imbil: 1st and 2nd September.
Enoggera: 2nd September.
Malanda, 6th and 7th September.
Innisfail: 8th and 9th September.
Mary Valley: 1st and 2nd September.
Kenilworth: 30th September.
Southport: 6th October.
Nerang: 13th October.

## PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of June, 1933 (273 days period unless otherwise stated).

| Name of Cow. | Owner. | Milk Production. | Butter-Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| | AUSTRALIAN ILLAWARRA SHORTHORNS. | | | |
| | JUNIOR (3 YEARS OLD, UNDER 3½ YEARS), STANDARD 270 LB. | | | |
| Fancy of Navillus | C. O'Sullivan, Greenmount | 10,871·5 | 384·464 | Charmer of Glenleigh |
| | SENIOR (2 YEARS OLD, OVER 2½ YEARS), STANDARD 250 LB. | | | |
| Dolly II. of Headlands | G. A. Heading, Murgon | 10,345·21 | 380·835 | Duchess Jellicoe of Fairfield |
| Gwen of Montcairn | A. E. Vohland, Aubigny | 7,295·95 | 326·966 | Plum Boys Pride of Pinelands |
| | JUNIOR (2 YEARS OLD, UNDER 2½ YEARS), STANDARD 230 LB. | | | |
| Marn Patty | R. Martin, Coalstoun Lakes | 7,620·5 | 361·844 | Triumph of Happy Valley |
| Amy II. of Navillus | C. O'Sullivan, Greenmount | 8,313·25 | 343·563 | Midgets Sheik of Westbrook |
| Stately 2nd of Blacklands | A. Pickels, Wondai | 7,777·75 | 317·782 | Fussy's Monarch |
| Balcarres Maiden | Mrs. C. A. Littleton, Pinelands | 6,748·35 | 310·755 | Envoy of Morden |
| Westbrook Blanche 7th | F. C. G. Couper, Westbrook | 6,141·68 | 247·822 | Novai Talisman |
| Roxey of Montcairn | A. E. Vohland, Aubigny | 6,138·85 | 247·388 | Dandy of Wilga Vale |
| Westbrook Biddy | F. C. G. Couper, Westbrook | 5,061·62 | 242·768 | Novai Talisman |
| | JERSEY. | | | |
| | MATURE COWS (OVER 5 YEARS), STANDARD 350 LB. | | | |
| Oxford Dafodil (200 days) | E. Burton and Sons, Wanora | 6,345·24 | 392·418 | Oxford Brighton King |
| | JUNIOR (4 YEARS, UNDER 4½ YEARS), STANDARD 310 LB. | | | |
| Keepers Darling | J. Sinnamon and Sons, Moggill | 8,362·09 | 404·363 | Keeper |
| Kelvinside Olive Oil | B. J. Jensen, Rosevale | 6,533·5 | 369·317 | Mercedes King of Glen Iris |
| | SENIOR (2 YEARS, OVER 2½ YEARS), STANDARD 250 LB. | | | |
| Bremerside Snowflake | B. J. Jensen, Rosevale | 5,271·5 | 312·064 | Kelvinside Noble Chieftain |
| | JUNIOR (2 YEARS, UNDER 2½ YEARS), STANDARD 230 LB. | | | |
| Waverley Pretty Lady | D. R. Hutton, Cunningham | 5,534·63 | 266·493 | Oxford Gem's Noble II. |
| Airlie Handsome Girl 3rd | D. Finlay, Yarranlea | 4,293·25 | 240·941 | Airlie Twylish |
| | GUERNSEY. | | | |
| | JUNIOR (2 YEARS, UNDER 2½ YEARS), STANDARD 230 LB. | | | |
| Moonji Peeress | W. R. Smee, Peeramon | 7,390·15 | 342·483 | Caramara Favour |

## CLIMATOLOGICAL TABLE—JUNE, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. Means. Max. | Means. Min. | Extremes. Max. | Date. | Min. | Date. | Rainfall. Total. | Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| *Coastal.* | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| Cooktown .. .. | 30·01 | 79 | 69 | 83 | 1, 2 | 63 | 9 | 179 | 9 |
| Herberton .. .. | .. | 69 | 53 | 77 | 1 | 43 | 9 | 173 | 10 |
| Rockhampton .. .. | 30·10 | 74 | 52 | 79 | 9, 10, 30 | 42 | 25, 26 | 155 | 6 |
| Brisbane .. .. | 30·14 | 70 | 51 | 74 | 4 | 38 | 28 | 137 | 7 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. | 30·16 | 68 | 39 | 75 | 2 | 27 | 27 | 102 | 6 |
| Stanthorpe .. .. | .. | 60 | 35 | 67 | 2 | 21 | 27 | 249 | 13 |
| Toowoomba .. .. | .. | 63 | 42 | 69 | 13 | 28 | 27 | 71 | 8 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·99 | 82 | 58 | 87 | 7 | 38 | 24 | 37 | 3 |
| Longreach .. .. | 30·11 | 73 | 46 | 80 | 16 | 37 | 25, 26 | 118 | 5 |
| Mitchell .. .. | 30·17 | 66 | 37 | 72 | 8, 16 | 27 | 19 | 113 | 3 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 30·02 | 80 | 58 | 87 | 29, 30 | 42 | 26 | 24 | 3 |
| Boulia .. .. | 30·10 | 74 | 47 | 83 | 16 | 37 | 26 | 34 | 1 |
| Thargomindah .. .. | 30·15 | 69 | 43 | 76 | 16 | 35 | 25 | 7 | 1 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JUNE, 1933 AND 1932, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. June. | No. of Years' Records. | Total Rainfall. June, 1933. | June, 1932. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 1·59 | 32 | 2·83 | 0·83 |
| Cairns .. .. | 2·82 | 51 | 4·23 | 0·71 |
| Cardwell .. .. | 1·99 | 61 | 2·54 | 1·40 |
| Cooktown .. .. | 2·02 | 57 | 1·79 | 0·17 |
| Herberton .. .. | 1·10 | 47 | 1·73 | 0·77 |
| Ingham .. .. | 2·30 | 41 | 3·30 | 0·80 |
| Innisfail .. .. | 7·14 | 52 | 7·75 | 3·87 |
| Mossman Mill .. | 2·08 | 20 | 3·17 | 0·75 |
| Townsville .. .. | 1·28 | 62 | 3·88 | 0·15 |
| *Central Coast.* | | | | |
| Ayr .. .. | 1·39 | 46 | 4·13 | 0 |
| Bowen .. .. | 1·59 | 62 | 2·89 | 0 |
| Charters Towers .. | 1·26 | 51 | 1·45 | 0·02 |
| Mackay .. .. | 2·62 | 62 | 3·02 | 1·09 |
| Proserpine .. .. | 3·30 | 30 | 3·23 | 0·48 |
| St. Lawrence .. | 2·52 | 62 | 1·45 | 0·88 |
| *South Coast.* | | | | |
| Biggenden .. .. | 2·20 | 34 | 1·59 | 0·18 |
| Bundaberg .. .. | 2·87 | 50 | 2·45 | 0·28 |
| Brisbane .. .. | 2·77 | 82 | 1·37 | 0·60 |
| Caboolture .. .. | 2·80 | 46 | 1·42 | 1·00 |
| Childers .. .. | 2·54 | 38 | 1·94 | 0·39 |
| Crohamhurst .. | 4·71 | 40 | 2·00 | 1·71 |
| Esk .. .. | 2·33 | 46 | 0·67 | 1·23 |
| Gayndah .. .. | 1·84 | 62 | 1·00 | 0·61 |
| Gympie .. .. | 2·74 | 63 | 1·84 | 1·08 |
| Kilkivan .. .. | 2·14 | 54 | 1·52 | 0·35 |
| Maryborough .. | 3·10 | 61 | 2·28 | 2·25 |
| Nambour .. .. | 3·92 | 37 | 2·44 | 1·93 |
| Nanango .. .. | 2·06 | 51 | 0·71 | 0·37 |
| Rockhampton .. | 2·61 | 62 | 1·55 | 0·75 |
| Woodford .. .. | 3·03 | 46 | 1·01 | 0·50 |

| Divisions and Stations. | Average Rainfall. June. | No. of Years' Records. | Total Rainfall. June, 1933. | June, 1932. |
|---|---|---|---|---|
| *Central Highlands.* | In. | | In. | In. |
| Clermont .. .. | 1·66 | 62 | 3·31 | 0·14 |
| Gindie .. .. | 1·44 | 34 | .. | 0·16 |
| Springsure .. .. | 1·76 | 64 | 1·79 | 0·77 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 1·70 | 63 | 1·02 | 1·62 |
| Emu Vale .. .. | 1·56 | 37 | 1·28 | 0·36 |
| Hermitage .. .. | 1·87 | 27 | 1·26 | 0·45 |
| Jimbour .. .. | 1·73 | 45 | 0·76 | 1·61 |
| Miles .. .. | 1·81 | 48 | 2·11 | 0·74 |
| Stanthorpe .. | 1·95 | 60 | 2·49 | 0·80 |
| Toowoomba .. | 2·47 | 61 | 0·71 | 1·05 |
| Warwick .. .. | 1·79 | 68 | 1·39 | 0·64 |
| *Maranoa.* | | | | |
| Roma .. .. | 1·61 | 59 | 0·94 | 0·78 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 1·40 | 19 | 0·90 | 0·68 |
| Gatton College .. | 1·92 | 34 | 1·03 | 1·04 |
| Kairi .. .. | 1·32 | 19 | 2·33 | 0 |
| Mackay Sugar Experiment Station | 2·31 | 36 | 3·53 | 1·15 |

GEORGE G. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

| | August. 1933. | | September. 1933. | | MOONRISE. Aug. 1933. | MOONRISE. Sept. 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | p.m. | p.m. |
| 1 | 6·35 | 5·21 | 6·7 | 5·37 | 12·19 | 2·24 |
| 2 | 6·34 | 5·22 | 6·6 | 5·37 | 1·18 | 3·33 |
| 3 | 6·33 | 5·22 | 6·5 | 5·38 | 2·24 | 4·39 |
| 4 | 6·33 | 5·23 | 6·4 | 5·38 | 3·33 | 5·42 |
| 5 | 6·32 | 5·24 | 6·3 | 5·39 | 4·43 | 6·42 |
| 6 | 6·32 | 5·24 | 6·2 | 5·39 | 5·52 | 7·41 |
| 7 | 6·31 | 5·25 | 6·1 | 5·40 | 7·8 | 8·39 |
| 8 | 6·31 | 5·26 | 6·0 | 5·40 | 8·0 | 9·38 |
| 9 | 6·30 | 5·26 | 5·58 | 5·41 | 9·2 | 10·35 |
| 10 | 6·29 | 5·26 | 5·57 | 5·41 | 9·56 | 11·35 |
| 11 | 6·28 | 5·27 | 5·56 | 5·42 | 10·53 | .. |
| | | | | | | a.m. |
| 12 | 6·27 | 5·27 | 5·55 | 5·42 | 11·52 | 12·25 |
| 13 | 6·26 | 5·28 | 5·54 | 5·43 | .. | 1·16 |
| | | | | | a.m. | |
| 14 | 6·25 | 5·28 | 5·52 | 5·43 | 12·47 | 2·7 |
| 15 | 6·24 | 5·29 | 5·51 | 5·44 | 1·40 | 2·51 |
| 16 | 6·23 | 5·29 | 5·50 | 5·44 | 2·34 | 3·32 |
| 17 | 6·23 | 5·30 | 5·49 | 5·44 | 3·26 | 4·8 |
| 18 | 6·22 | 5·30 | 5·48 | 5·45 | 4·12 | 4·40 |
| 19 | 6·21 | 5·31 | 5·47 | 5·45 | 4·57 | 5·11 |
| 20 | 6·20 | 5·32 | 5·46 | 5·46 | 5·37 | 5·43 |
| 21 | 6·19 | 5·32 | 5·44 | 5·46 | 6·10 | 6·15 |
| 22 | 6·18 | 5·33 | 5·43 | 5·47 | 6·40 | 6·48 |
| 23 | 6·17 | 5·33 | 5·42 | 5·47 | 7·10 | 7·25 |
| 24 | 6·16 | 5·34 | 5·41 | 5·47 | 7·42 | 8·11 |
| 25 | 6·15 | 5·34 | 5·40 | 5·48 | 8·13 | 9·4 |
| 26 | 6·14 | 5·34 | 5·38 | 5·48 | 8·47 | 10·5 |
| 27 | 6·12 | 5·35 | 5·37 | 5·49 | 9·26 | 11·9 |
| 28 | 6·11 | 5·35 | 5.36 | 5·49 | 10·14 | 12·15 |
| | | | | | | p.m. |
| 29 | 6·10 | 5·35 | 5·35 | 5·50 | 11·9 | 1·21 |
| 30 | 6·9 | 5·36 | 5·34 | 5·50 | 12·11 | 2·27 |
| 31 | 6·8 | 5·36 | | | 1·16 | |

## Phases of the Moon, Occultations, &c.

| | | | |
|---|---|---|---|
| 6 Aug. | ○ | Full Moon | 5 31 a.m. |
| 13 ,, | ☽ | Last Quarter | 1 49 p.m. |
| 21 ,, | ● | New Moon | 3 47 p.m. |
| 28 ,, | ☾ | First Quarter | 8 13 p.m. |

Perigee, 4th Aug., at 2.36 a.m.
Apogee, 16th Aug., at 12.48 a.m.
Perigee, 31st Aug., at 3.30 p.m.

The astronomical event of this month will be the annular eclipse of the Sun on the 21st. On a line from Port Darwin to 2 degrees south of Port Denison, not exceeding 170 miles wide, the beautiful effects of a golden ring of the Sun in place of its usual orb may be seen to more or less perfection. Throughout the rest of Queensland a partial eclipse of the Sun, greatest near the line mentioned, but a good deal reduced at Warwick and places near the southern border, will form a highly interesting spectacle. At Sydney, only about one-half of the Sun will be eclipsed, and this at sunset. At Brisbane the eclipsed part of the Sun will be somewhat larger.

The occultation of Antares by the Moon, which will take place on the evening of the 1st, will require binoculars or telescope as the Moon will be rather more than half full. Observers in Queensland near the 150th meridian should be on the lookout between 9 and 10 p.m.

On the 5th Saturn will be in opposition to the Sun rising as the Sun sets, and setting about the time of sunrise. At 6 o'clock on the following morning the full Moon will be passing from west to east of Saturn, which will be only half a degree to the north of it.

When the Moon passes Uranus on the 11th there will be a wide space equal to the length of the Southern Cross between them.

On the 17th, when Venus passes Jupiter, at a time when they are invisible here there will be apparently only one-tenth of a degree separating them.

On the following day Mercury will be 19 degrees west of the Sun, well above the eastern horizon more than an hour before sunrise.

Mercury rises 25 minutes before the Sun on the 1st and 1 hour 17 minutes before it on the 15th.

Venus sets at 7.23 p.m. on the 1st, and at 7.58 p.m. on the 15th.

Mars rises at 9.52 a.m. and sets at 10.22 p.m. on the 1st; on the 15th it rises at 9.23 a.m. and sets at 10.6 p.m.

Jupiter rises at 8.54 a.m. and sets at 8.40 p.m. on the 1st; on the 15th it rises at 8.6 a.m. and sets at 7.59 p.m.

Saturn rises at 5.37 p.m. and sets at 7.3 a.m. on the 1st; on the 15th it rises at 4.38 p.m. and sets at 6.3 a.m.

| | | | |
|---|---|---|---|
| 4 Sept. | ○ | Full Moon | 3 4 p.m. |
| 12 ,, | ☽ | Last Quarter | 7 30 a.m. |
| 20 ,, | ● | New Moon | 4 20 a.m. |
| 27 ,, | ☾ | First Quarter | 1 36 a.m. |

Apogee, 12th September, at 7.6 p.m.
Perigee, 25th September, at 8.30 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

# QUEENSLAND AGRICULTURAL JOURNAL

VOL. XL. 1 SEPTEMBER, 1933. PART 3.

## Event and Comment.

### The Governor's Speech—A Record of Rural Progress.

IN opening the Second Session of the Twenty-sixth Queensland Parliament on Tuesday, 15th August, His Excellency the Governor, Colonel The Right Honourable Sir Leslie Orme Wilson, reviewed, in the course of his speech, the progress of country life in this State during the year, and forecast new legislation that will have an important bearing on our rural industries. His Excellency said that since he opened Parliament in August of last year he had travelled over 19,000 miles in visiting various parts of Queensland, and everywhere he had found a very real sense of loyalty to the throne and person of His Majesty the King, and, as his representative, he had been given a most warm and generous welcome in every town or district he had visited. "While we are at the moment," he said, "passing through difficult times, which are, unfortunately, to be found in every part of the world, I can feel nothing but confidence in the future of this State. The fertility of the soil and the character of the people are assets which no temporary depression can destroy, and I feel convinced myself that, with vision and determination to succeed, Queensland must advance along the road to full prosperity and commercial greatness."

Following are other excerpts from His Excellency's speech, which are of especial interest to primary producers:—

> The Queensland Government has done more to assist the wool industry during its period of depression than any other Government in Australia. Most sheep-grazing land in Queensland is held under lease from the Crown as grazing selections and pastoral leases, and very valuable concessions have been granted by the Government. The season has not been generally favourable to the sheep and wool industry. Generous and unexpected rain in July gave State-wide relief, and should ensure a good spring. Happily for all concerned, the prices realised for wool appreciated towards the end of the wool-selling season. There is reason to think that the advance is sound, and that even better prices may be looked for in the future.
>
> The 1932 sugar crop yielded 514,000 tons of sugar, valued at £9,700,000. The reduction from the previous season's yield was due in a large measure to the subnormal season which prevailed in the southern sugar areas.

The cotton-growing acreage further expanded during the past season, and the total yield will probably reach 11,000 bales for this season.

The climatic conditions experienced over the dairying areas of the State during the past year were generally unfavourable for dairy production, but notwithstanding this the output of butter during the period exceeded that of the previous year by approximately 5,000,000 lb., while cheese production showed a slight increase.

To assist in solving the many problems associated with the profitable development of extensive areas of fertile tropical jungle lands having an assured rainfall which are to be made available shortly for settlement, a tropical research station is about to be established.

Pig raising is becoming an increasingly important factor in our rural economy, and to give added stimulus to production my advisers intend launching a definite scheme for improvement of the pig industry, which will provide for financial assistance to approved farmers. In co-operation with the Meat Industry Board, the Board of Animal Health, and other interests, a pig industry research and experiment section will be added to the Animal Health Station at Yeerongpilly.

My advisers recognise the desirableness of assisting farmers and settlers through the Agricultural Bank in all suitable cases with as few restrictions and in as liberal a manner as possible. During the last financial year advances amounting to £354,000 were approved under the Agricultural Bank Acts.

One of the most distressing phases of the problem of unemployment is the lack of suitable openings for our growing youths. Among other projects my advisers have planned the farm training school for boys at St. Lucia, which was opened in January last, and it is gratifying to record that success has attended the project. Practical instruction is given in pioneering and the routine work of farm and dairy and, generally, everything possible is being done to fit the boys for country life and industry. As a greater incentive to earnest trainees, two scholarships tenable at the Queensland Agricultural High School and College will be granted at the end of each half-yearly period. My advisers have also adopted a scheme for rural training of youths direct by the farmer. Although the scheme is really only yet in its infancy, 252 youths have been allotted to farmers. In addition, through its co-operation and assistance, the total number of boys placed in permanent farm work from the Riverview Training Farm has reached 200.

During the year which has just closed, Main Roads Funds have been devoted largely to the construction of roads of a developmental character, particularly in Northern Queensland. The improvement of roads in settled areas has also progressed continuously throughout the year, and, on the average, employment has been given to 3,750 men per month. The Government intends to pursue a vigorous road construction policy during the current financial year.

A new policy has been embarked upon at the Aboriginal settlements under which the natives are, as far as possible, to be trained in the various crafts necessary to carry on the work of the settlements, and it is expected that these will, in time, be staffed almost wholly by natives, stimulating racial pride and confidence, and removing that inferiority complex which is one of the main factors in the destruction of the native race.

Among other proposals to be brought before Parliament, and which were listed in His Excellency's Speech, are:—A Motor Spirit Bill; a Main Roads Bill; a Land Bill; an Unproductive Private Land Development Bill; a Grazing Districts Improvement Bill; an Irrigation Bill; a Wire and Wire Netting Bill; a Tobacco Industry Protection Bill; a Pig Industry Bill; a Dairy Industry Stabilisation Bill; a Primary Producers' Organisation and Marketing Bill; and a Regulation of Cane Prices Bill.

## Let us go Forward !

"LET us go forward, everyone working to make full use of the natural wealth that Providence has given us."

Such was the stirring appeal which His Excellency the Governor (Sir Leslie Wilson) made at a Show week gathering representative of all sections of public, professional, and industrial life. His Excellency stressed the need for extending the markets for Australian produce, and urged the wisdom of effecting trade treaties with friendly countries.

His Excellency congratulated the Royal National Association on having been able to secure a man of the calibre of Sir Donald Cameron as its president. Proceeding, Sir Leslie Wilson said he had derived much pleasure and profit from his travels through Queensland, and was glad now to have the opportunity of learning still more from the Show, as to the wonderful resources of the State. To-day we were living in extraordinary times. He could not believe that at any time in the past the world had been faced with such a serious crisis as at present. The people of Australia, however, could consider themselves fortunate in living in a primary producing country so richly endowed by Nature. The country's recuperative powers were such that, without undue optimism they could see some blue in the clouds that surrounded the world.

They had been looking for some good results from the World Economic Conference which had been sitting in London, but it was no use their shutting their eyes to the fact that the conference had not been fruitful of very great results. He thought the reason for the failure was very evident. The conflicting interests of so many nations made success virtually impossible. He had been informed in a letter from a very important person in London that, while Britain and the Empire generally were prepared to go a long way in order to secure agreement, there were other nations who could not see eye to eye with them.

Sir Leslie said he believed that people in Australia had learned that they must co-operate with other nations if a better state of affairs were to be brought about. Firstly, they must find work for the many thousands of unemployed in their own State, and, secondly, it behoved them to find useful employment for the 5,000 lads in Queensland who came to the working age every year. The country must be able to sell its exportable produce, which increased in quantity and quality every year. Each year more and more land was placed under closer settlement, and during the past year it was pleasing to note that 5,000,000 acres had been placed under occupation. Although he did not wish to comment on the subject of policy, he thought he could say that that was a wise and far-reaching course to pursue, and one which, he hoped, would be carried fully into effect. Closer settlement must lead to increased production, and must yield more for export.

His Excellency recalled that some years ago he met the late Mr. Alfred Deakin in London, and heard him make a notable speech, in the course of which the then Prime Minister of Australia said: "In all matters of commerce and trade it is the buyer who is the king, and the seller who is the courtier." Queensland had goods to sell; Great Britain had been, was now, and always would be our best customer, but it seemed to him that the time must come—and it would not be very far ahead—when Great Britain, with all the best will in the world, would be unable to take all Australia's exportable surplus. All the Ottawa agreements and treaties could not be expected to increase the capacity of a man's stomach. At present Britain took about 53 per cent. of our exportable produce, and Japan only 11 per cent., while Malaya, India, the Dutch East Indies, and other countries who were geographical neighbours of Australia took a very small percentage.

It was essential that Australia should find markets for her products, and he would suggest that attention be paid to the striking figures of overseas trade. Action should be taken to cultivate friendly commercial relations with proximate countries—some with huge populations and others that were smaller—in order that trade agreements might be effected, which would give greater security in regard to the future prosperity and welfare of this country and its people. "Progress must be made," concluded His Excellency. "Let us go forward, every one working together, to make full use of the natural wealth which Providence has given us. Let us make this State one of the brightest jewels in the diadem of the British Crown."

## Women on the Land.

"IN lauding the improvement in primary production Queensland must pay deserving tribute to the work of the women on the land," declared the Premier (Hon. W. Forgan Smith) at a Show week function.

The Premier was discussing his impressions of the Royal National Show. Much was heard of the value of the man on the land, he said, but in his estimation the value of the women on the land was of equal importance to the State. Those exhibits which bore evidence of the handiwork of women must impress the observer. They indicated the wonderful part that women played in the development of the country and of primary production. The Premier added that he had been impressed by the improvement shown in the dairy stock. The fruit and cotton sections were also most impressive, and he had been particularly interested in the district and one-man farm displays.

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

### THE GREYBACK BEETLE.

(September Notes.)

By EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

## PREDOMINANCE OF THE PUPAL STAGE OF OUR GREYBACK BEETLE.

THE month of September is essentially associated with the pupal condition of this cockchafer, and it will be found that 90 per cent. or more of the specimens unearthed during the course of deep ploughing or breaking up of old cane lands are examples of this curious stage in the life of our greyback. The pupa of a beetle corresponds to the so-called chrysalis form in butterflies, representing a period when locomotion and feeding ceases altogether for a time, while the life juices of grub or caterpillar undergo a marvellous transformation into what has been termed the perfect state of an insect.

These seemingly innocent phases of life, however, although defenceless, non-aggressive, and motionless, represent in the present case a future destructive brood of cockchafers, a fact which canegrowers should always bear in mind when preparing such ground for planting. Remember, that the grubs derived from eggs of a single greyback (thirty-six in number) are able, under favourable conditions, to destroy six stools of cane. (The plate for this month indicates a period of temporary inactivity, the ground being occupied only by mummy-like pupæ of our greyback cane beetle, each lying motionless in its tomb-like cavity. Above them is a newly planted cane sett starting to grow.

### Construction of the Hand-injector.

The appliance being used in North Queensland for fumigating cane grubs is an injector manufactured by John Danks and Son, of Melbourne and Sydney.

The accompanying drawing shows its internal arrangement and the method employed for ejecting from the spear varying quantities of liquid fumigant. Special attention should be given to the position of the different washers, indicated in black, as these have to be renewed occasionally when worn out. In this connection the following advice from the Assistant Entomologist at Meringa Experiment Station, Mr. J. H. Buzacott, regarding possible sources of such trouble and how to deal with them, will be found invaluable, and should be carefully studied:—

"1. Washers L and V sometimes require replacing. This is denoted by external leaks at L or V.

"2. Main pump washer G frequently requires tightening or replacing. To tighten, screw up nut J after first unscrewing compression chamber assembly from tank assembly. To replace washer, remove nut J and pull out old washer with a piece of wire. Wind about 2 inches of a narrow strip of raw hide round plunger, and force into cavity with a wire. Then screw nut J back into place and tighten gently. If this washer requires tightening or renewing, it is shown by weak pressure of injection.

"3. Ball valve seat H sometimes has dirt on it, and this also causes weak injection. The remedy is to clean the valve well.

"4. If the pump leaks at the bottom hole when the spring plunger is up, the cause is a faulty washer X, a bent compression valve stem R, or insufficient tension on valve spring Q, owing to nut Y not being screwed up sufficiently tight. To replace washer X, unscrew spear from compression chamber assembly at V, take off nut Y and remove old washer. Cut new leather washer to fit in recess in Y and with central hole to fit on stem R. Rescrew Y on R and adjust tension so valve does not leak. If a bent valve stem R is the trouble, the whole valve assembly must be screwed out by means of a special box spanner, which fits over squared portion U. The valve stem is then removed and straightened. When replacing valve assembly the washer S must be in good order.

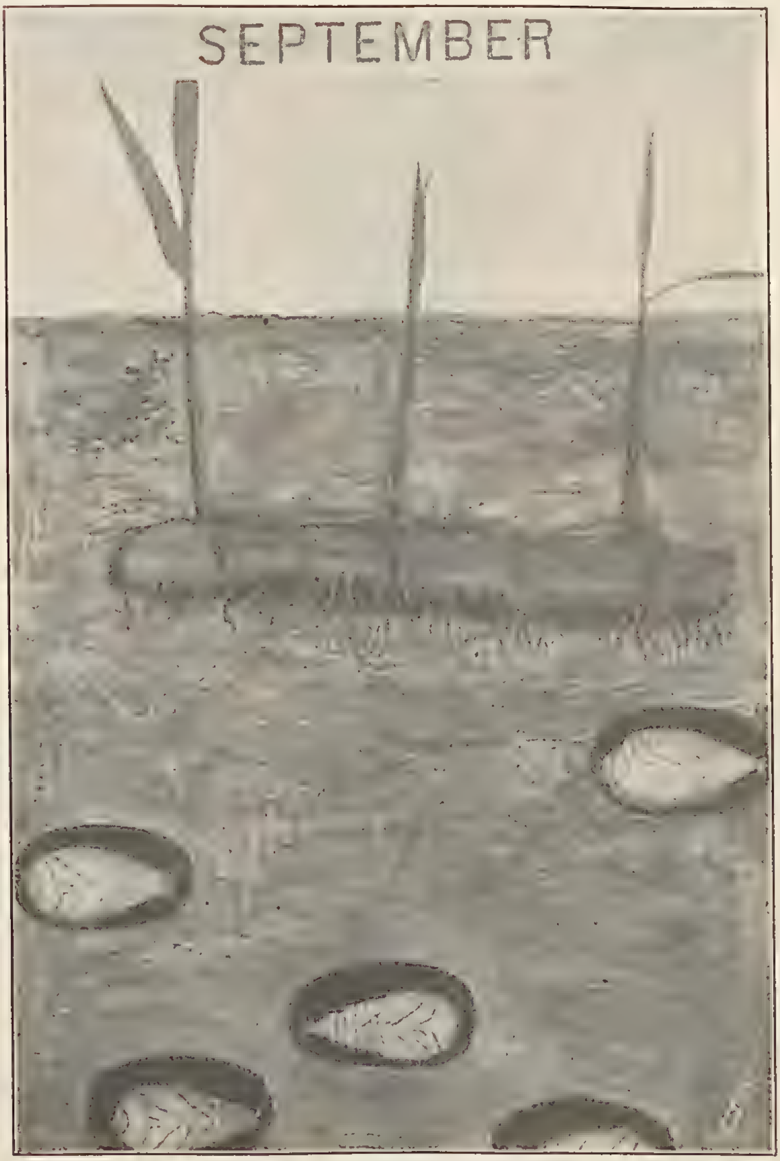


Plate 59.—Pupæ of greyback cockchafer lying under cane sett; awaiting transformation into beetles (about half natural size).

"5. Should it be found difficult to press in the plunger of the injector, it will probably be due to the delivery passage Z being blocked. This may be freed by passing a thin wire through it.

"6. It sometimes happens that the main spring will not return the plunger to its proper position. Usually this is caused by the pin retaining the brass collar about half way up the plunger having sheared, thereby releasing tension on the spring. The old pin must be driven out and the collar held in its correct position by means of a new steel pin riveted in position. A broken main spring or a bent plunger can cause the same effect. For the former a new spring is necessary, and to cure the latter it must be removed and straightened.

*Note.*—An injector will not work correctly if the hole in the stopper of the tank is blocked up. Some operators place pieces of grass in this vent to prevent splashing, but if this is done the instrument will not deliver the correct dosage, owing to the vacuum created within the tank preventing the liquid from running freely through passages E and F.

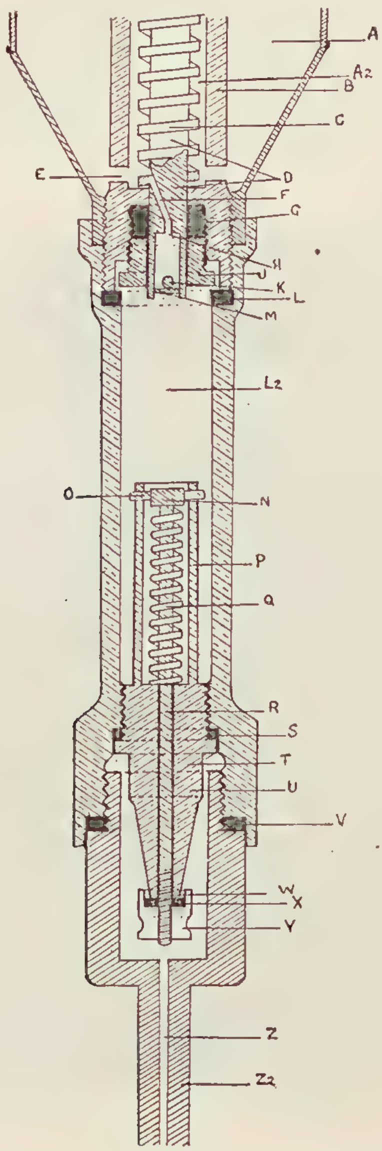


PLATE 60.—Internal mechanism of Danks' Hand-Injector, showing positions of washers, springs, valves, delivery passage, &c.

KEY TO DIAGRAM OF DANKS' INJECTOR.

A. Main liquid container or tank.
A2. Spring guide chamber.
B. Main spring guide.
C. Main spring.
D. Plunger rod.
E. Passage between tank and guide chamber.
F. Passage through plunger rod.
G. Main pump washer.
H. Ball valve seat.
J. Nut retaining pump washer.
K. Ball valve.
L. Upper compression chamber washer.
L2. Compression chamber.
M. Pin retaining ball valve.
N. Collar retaining compression valve.
O. Guide pins.
P. Compression valve spring guide.
Q. Compression valve spring.
R. Compression valve stem.
S. Compression valve guide washer.
T. Compression valve guide.
U. Squared portion for box spanner.
V. Spear washer.
W. Valve seat.
X. Leather valve washer.
Y. Knurled nut adjusting tension of valve spring.
Z. Delivery hole or passage.
Z2. Spear.

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**TO NEW SUBSCRIBERS.**

**New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.**

**When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.**

**Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.**

**Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.**

# Cutworm Control.

By ROBERT VEITCH, B.Sc. Agr., B.Sc. For., F.E.S., Chief Entomologist.

THE present issue of the "Queensland Agricultural Journal" is an appropriate one in which to draw attention to the measures that may be adopted for the control of one of the most important insects associated with Queensland crops. The species selected for discussion this month is the brown cutworm, which is annually responsible for losses of a varying degree of intensity. The necessary procedure for dealing with this pest is indicated in the following paragraphs, which also include a short description of the insect whereby it is hoped that growers, who may not be acquainted with it, will be able to identify the species for themselves.

## The Brown Cutworm.

Cutworms are the larvæ of certain species of moths and are so designated because of their habit of attacking the stems of their host plants at or near ground level, thus causing them to topple over. They shelter in the soil during the day and feed at night, and as a result of their nocturnal feeding habits growers are often puzzled to account for the loss of young plants. If these losses are due to cutworms an examination of the soil to a depth of one or two inches will reveal the presence of the insects.

The most destructive Queensland species is the brown cutworm, *Euxoa radians* Guen., its activities being particularly serious during the spring months. When full grown, this cutworm (Plate 61) is about one and a-half inch in length or even longer, and is a stout soft bodied, grey-brown or grey-green grub, sometimes possessing a faint pinkish tinge.

The destruction of seedlings is not the only baneful activity of cutworms, for well grown plants may be more or less defoliated. It is also important to note that the work of these pests is not necessarily confined to the plants on or in the immediate vicinity of which the moths laid the eggs from which the cutworms hatched. Where pressure of population is great and food supplies are nearing exhaustion, migration may take place—e.g., cultivated plants may be destroyed by an invasion of cutworms from an adjoining weedy fallow or abandoned area.

Cutworms attack a very wide range of host plants, losses being particularly severe in cotton, tomatoes, tobacco, maize, and vegetables. The commonest weed host plants are pigweed and bullhead.

## Control.

Fortunately the control of cutworms is a relatively simple and inexpensive matter. In the first place, cultivation should aim at the prevention of the growth of weed host plants in the area to be planted up and, once it is planted, weeds should be kept well in check. Should they get out of hand and become heavily infested with cutworms they should not be eliminated by cultivation without applying the usual poison bran bait immediately after cultivation. If this is not done the cutworms will promptly concentrate all their feeding energies on the cultivated crop with disastrous results thereto.


PLATE 61.—THE BROWN CUTWORM (*Euxoa radians* Guen.).

Fig. 1 Eggs × 20.
Fig. 2 First instar × 8.
Fig. 3 Last instar × 1½.
Fig. 4 Pupa × 2.
Fig. 5 Adult Male, natural size.
Fig. 6 Adult Female, natural size.

Where it is necessary to protect a crop against cutworm attack, poison bran bait may be prepared and applied as follows:—Thoroughly mix 25 lb. of bran with 1 lb. of Paris green while still dry; then mix 1 quart of molasses in water. The molasses and water is then mixed with the bran and Paris green, the whole being well stirred up, enough water being used to obtain the desired consistency. Generally 2 gallons of water is required in the formula given, but only sufficient should be used to make a crumbly bait.

The poison bait is best applied in the late afternoon so that it is fresh and palatable when the cutworms come out to feed at night. The amount of bait to be used per acre will depend on several factors such as the intensity of the infestation, the nature of the crop to be protected, and whether the bait is to be broadcasted or applied in rows. A light broadcasting requires about 50 lb. dry weight of bran per acre, whereas if protection is to be afforded by sprinkling along the rows of plants to be protected 25 lb. dry weight of bran per acre may be adequate in crops in which the rows are 4½ feet apart. That means that in the latter case the amount of bait prepared according to the formula given in the preceding paragraph would be sufficient for one acre.

When treating plants in the row the bait should be placed under and near the plants, but not touching them.

The exact amount of bait to use in each case must of necessity be left to the discretion of the grower, and will be determined by the intensity of the attack and the economics of the particular crop to be protected. Circumstances may warrant the use of heavier applications than those already mentioned.

A word of warning must be issued with respect to the application of this control measure, and it is that proper precautions should be taken to ensure that domestic animals, such as poultry, cannot have access to the baited fields. Furthermore the bait must on no account contaminate plants, or portions of plants, to be used for consumption by man or animal.

Where cutworms are migrating from neighbouring areas much benefit may be derived from scattering the bait in front of the advancing cutworms, thus creating a poisoned barrier zone between the crop and the area whence the invasion is proceeding. Where the invasion has actually reached the marginal rows of the crop to be protected, the bait should be scattered in small heaps round the cultivated plants.

Protection is also sometimes afforded by ploughing a furrow a short distance in front of the line of advance of the cutworms and scattering bait in the bottom of the furrow. The steep side of the furrow should, of course, be next to the area to be protected and should thus face the advancing cutworms. The success of this control measure is dependent on suitable soil conditions and the formation of a well-drawn furrow. The side next to the area to be protected should be of loose crumbly soil. Should it become caked by rain it will be ineffective, and if the cutworms are still advancing it should be redrawn. The best procedure in applying this control measure is to open the furrow, throwing the loose earth towards the area the grower wishes to protect. The return furrow can then be cut into this, leaving a line of loose earth above a steep face. A second furrow is usually necessary to deal with the cutworms that succeed in crossing the first barrier.

# Experiments with Baits for the Control of Certain Cotton Pests.

By D. O. ATHERTON, B.Sc., Assistant Entomologist.

ALTHOUGH several forms of baits have been used successfully for the determination of flight periods of certain species of moths, discouraging results have generally been the experience of those endeavouring to use baits as a means of controlling lepidopterous pests of crops. However, in spite of this unpropitious outlook, it was considered that the trial of baits was warranted as a control measure for lepidopterous pests of cotton—particularly for the corn ear worm (*Heliothis obsoleta* Fabr.). The prohibitive expense incurred by the direct application of insecticides in the case of a crop producing such a low return per acre as cotton does, and the comparative failure of the maize trap to protect cotton in a "late" season, contributed to the decision in favour of conducting baiting trials. By a "late" season is meant the delay in the arrival of the early spring rains, or their total failure, thus prohibiting the planting of cotton until the summer rains commence.

## Baits.

It was decided that a bait liquid which would effectively attract virgin and gravid female corn ear worm moths should be the goal of these trials. As oviposition does not really begin until after the female has fed (Quaintance and Brues),[1] a bait resembling nectar would be expected to give the best results. Accordingly a nectar substitute was the main constituent in all the bait liquids used in the experiments under discussion, the substitute being either molasses or honey diluted with water. Fermentation in these syrups is too rapid under some conditions, but the addition of sodium salts has the effect of retarding this process and consequently prolonging the period during which they are attractive (Frost).[2] The addition of aromatic esters has also been known to increase the efficacy of baits (Eyer).[3] As a rule, death of moths attracted to baits depends on the fact that once they alight on the surface of the liquid, they are unable to rise owing to the operation of surface tension forces (Peterson),[4] but the addition of a stomach poison might be expected to help. The height at which the pail containing the bait is placed above the ground has a direct bearing on its efficacy when used against certain moths in fruit trees. This point was considered worthy of attention during the trials against the corn ear worm and other lepidopterous pests of cotton.

## Pails.

Various types of bait pails, including enamel stew pans, tins 6 inches in diameter and 7 inches deep, and conical galvanised iron vessels 6 inches across the open end and 18 inches deep, have been used

with more or less success (Peterson),[4] (Eyer and Rhodes).[5] On the grounds of expediency the pails for these trials were made from 4-gallon kerosene or benzene tins—two pails from each tin. Each pail was stamped on the side at the level to which half a gallon of liquid reached when the bottom of the pail remained horizontal. All the pails were given a coat of paraffin wax on the inside in order that the corrosion of the tin should not interfere with the composition of the baits.

### Experiment No. 1.

Two strips of land each one chain wide, containing 1 acre and under Durango cotton, separated by a strip of like dimensions under Rhodes grass, were used in this trial. Thirty-two pails were required for the various liquid baits, and the latter can be divided into four main groups—A, B, C, and D, of eight pails each.

*A Group (A1 to A8).*—The syrup was composed of molasses and water in the proportions of 1 to 7, and to four of the pails kerosene was added at the rate of fifteen drops per pail. This was done to determine whether evaporation could be retarded without sacrificing the efficacy of the bait.

*B Group (B1 to B8).*—In these the syrup was identical with that used for the previous group but, in addition, sodium arsenite was added at the rate of 0·5 oz. per gallon.

*C Group (C1 to C8).*—The syrup was composed of honey and water in the proportions of 1 to 7, but in four of the pails the water was that in which Quassia chips, at the rate of 1 lb. to 2 gallons, had previously been soaked for eighteen hours.

*D Group (D1 to D8).*—These pails contained water only, and were intended to serve the purpose of base controls from which to evaluate the efficacies of the baits.

In each of the three groups, A, B, and C, four of the pails were placed on the ground and four were on stands 2 feet from the ground. To some of the pails in each group either amyl acetate or ethyl acetate was added at the rate of fifteen drops per pail. Further details of the bait composition in each pail are given in Table I.

The experiment was continued for a period of five weeks from 26th January to 1st March inclusive. The eight pails of B group were attended for an additional week, because in these a considerable number of moths were taken each day at the conclusion of the five weeks' period.

### Experiment No. 2.

Eight pails placed on the ground in half an acre of maize which was in silk were used in this trial. It was continued for four weeks almost concurrently with the other. When this trial was begun, the corn ear worm moths were ovipositing freely on the maize silks. The baits used were identical with some of those used in the first experiment, but the main object of this second trial was to determine whether the corn ear worm moth could be trapped in an area known to be densely populated by the gravid females.

## Weather.

Fine hot weather was experienced for most of the time and, although there were four falls of rain, the total amounted to 18 points. Daily maximum temperatures ranged from 87·5° F. to 103° F., with an average of 96·3° F. The daily minimum temperatures ranged from 58·2° F. to 75·0° F., with an average of 66·1° F. The rate of evaporation was consistently high, varying from 0·30 inches to 0·47 inches per day. It was therefore necessary to add water to each pail every day in order to keep the concentration of the baits constant. In five weeks almost 150 gallons of water were evaporated from the thirty-two pails in the first experiment.

## Collection of Data.

Every morning the numbers of moths found in each pail were recorded separately under three headings—viz., corn ear worm, green looper (*Antarchœa chionosticta* Turn.), and other species. Small moths with a wing expanse of much less than 1 inch were disregarded, as it was impossible to be certain that all of these in the molasses baits would be found each day. Therefore, although large numbers of the cotton leaf perforator (*Bucculatrix gossypii* Turn.) were often observed, no record of these numbers was kept, nor were they recorded in the numbers included as other species. The results of these daily observations are presented in Graph I. Throughout the whole of the period only two moths were taken in the D group pails of pure water; therefore these have been deleted from the records.

## Experimental Results.

The results obtained from the second experiment refute none of the conclusions which may be drawn from the first, and for this reason they are given no further consideration.

The experiments were designed to ascertain the attraction, if any, of the various baits for the corn ear worm moth. But, although relatively few moths of this species were captured, numerous others were taken in the pails. They included green looper, brown cutworm (*Euxoa radians* Guen.), rough bollworm (*Earias huegeli* Rogen.), cotton leaf perforator, *Sericea spectans* Guen., and others. From this it will be seen that moths varying in size from those with a wing expanse of 4 inches, to small species measuring less than half an inch across the outspread wings, can be held with equal security when they are effectively attracted into the baits. Of the species other than the corn ear worm, the green looper is of the greatest economic importance, though the brown cutworm and the cotton leaf perforator may be of some importance in certain years. Very few adults of the rough bollworm were trapped, even though this species was well represented in the field. A glance at Graph I. will emphasise the low numbers of corn ear worm moths trapped compared with those of green looper and unspecified moths.

Out of a total of 4,141 moths of all species recorded from all the pails, only 159 were of the corn ear worm, whereas there were 2,131 green looper moths and 1,851 others—the latter unspecified but including brown cutworm, rough bollworm, and *Sericea spectans*.

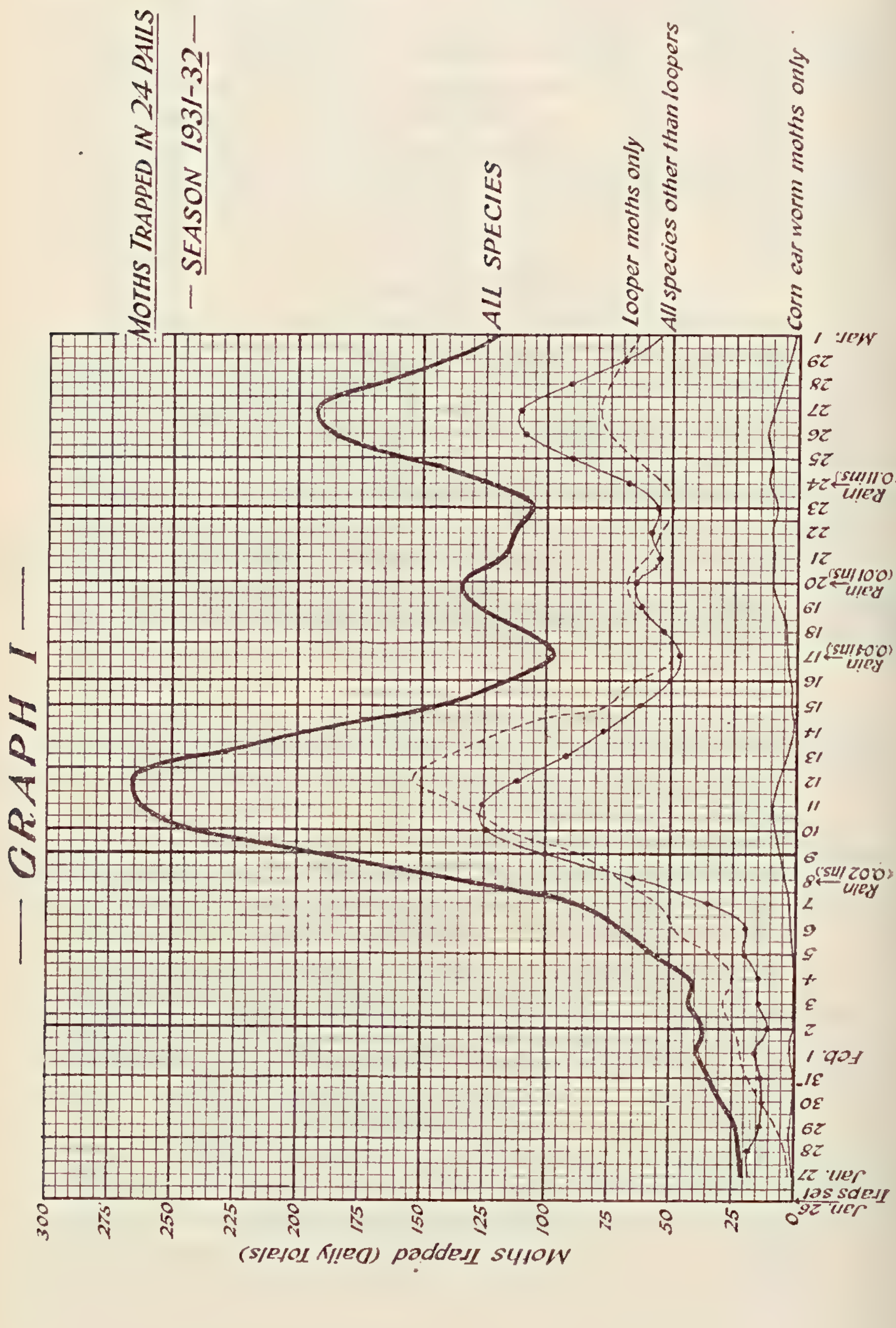
— GRAPH I —
MOTHS TRAPPED IN 24 PAILS
— SEASON 1931-32 —
ALL SPECIES
Looper moths only
All species other than loopers
Corn ear worm moths only
Moths Trapped (Daily Totals)
Jan. 26 Traps set
Jan. 27
Feb. 1
Mar. 1
Rain (0.02 ins.)
Rain (0.04 ins.)
Rain (0.01 ins.)
Rain (0.11 ins.)

PLATE 62.

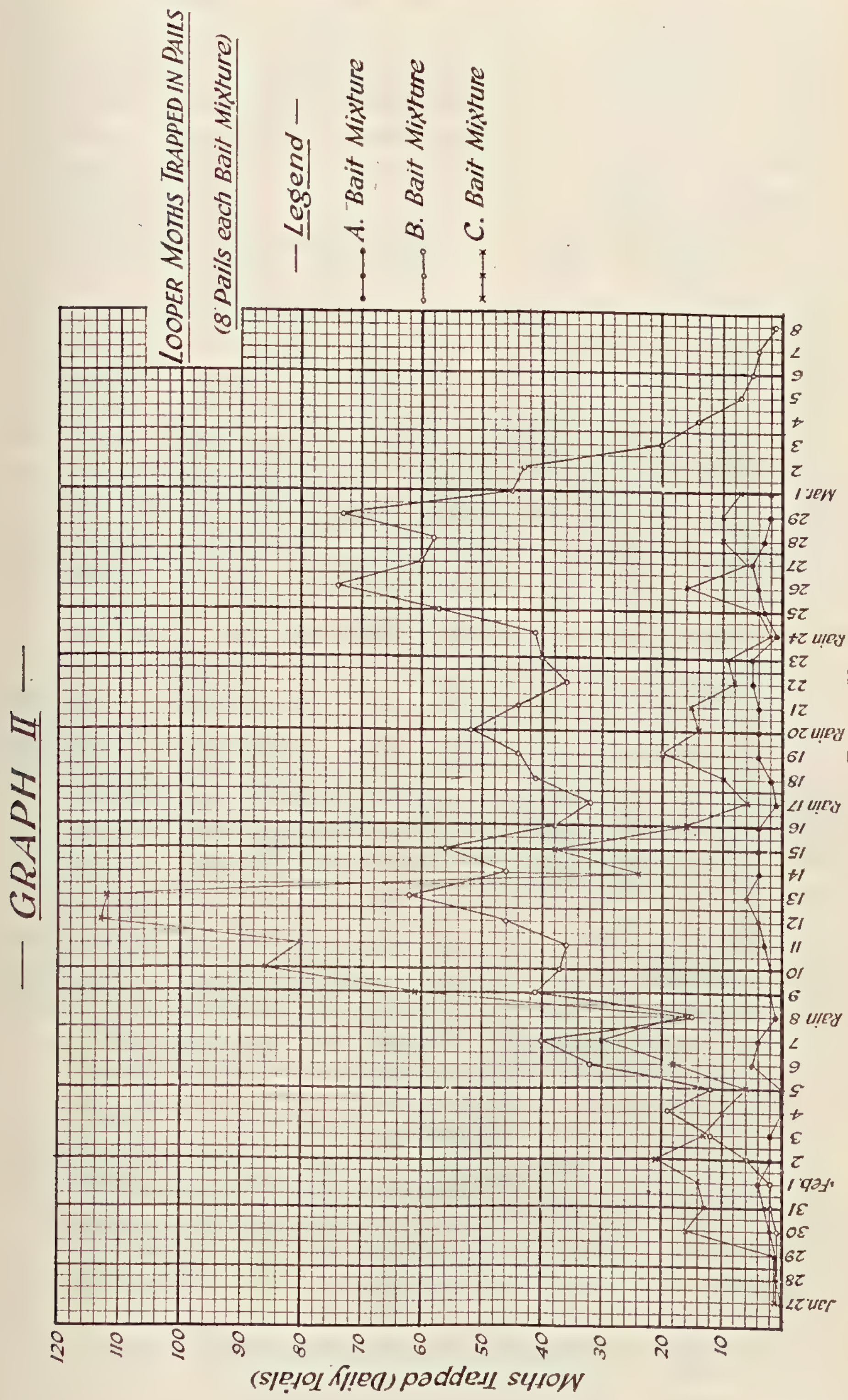
— GRAPH II —
LOOPER MOTHS TRAPPED IN PAILS
(8 Pails each Bait Mixture)
— Legend —
A. Bait Mixture
B. Bait Mixture
C. Bait Mixture
Moths Trapped (Daily Totals)
120
110
100
90
80
70
60
50
40
30
20
10
Jan 27
28
29
30
31
Feb 1
2
3
4
5
6
7
Rain 8
9
10
11
12
13
14
15
16
Rain 17
18
19
Rain 20
21
22
23
Rain 24
25
26
27
28
29
Mar 1
2
3
4
5
6
7
8

Plate 63.

The baits of A group (molasses and water) were practically ineffective, as the eight pails in five weeks trapped only 16 corn ear worm moths, 100 green looper moths, and 208 others; those of B group (molasses, sodium arsenite and water) trapped 86 corn ear worm moths, 1,202 green looper moths, and 740 others; the C group (honey and water) trapped 57 corn ear worm moths, 829 green looper moths, and 903 others.

The total number of moths taken in pails on 2-foot stands was 2,176 compared with 1,965 in pails placed on the ground, but of the 2,131 loopers trapped, 963 were taken in pails on stands and 1,168 in pails on the ground.

The addition of kerosene to four of the A group pails resulted in a catch of 147 moths, 37 of which were loopers, compared with a total of 177 moths, 63 of which were loopers, in the four pails to which no kerosene was added.

The four C group pails containing aqueous extract of Quassia chips trapped 782 moths, 425 of which were loopers, compared with a total of 1,007 moths, 404 of which were loopers, trapped by the four pails in which the honey was diluted with pure water.

Of the twenty-four pails comprising groups A, B, and C, the six containing ethyl acetate trapped 1,088 moths, 665 of which were loopers, and the six containing amyl acetate trapped 773 moths, 367 of which were loopers. The comparative numbers—i.e., half totals, for the twelve pails to which neither acetate was added were 1,140 moths, of which 550 were loopers.

Both Graphs I. and II show that few moths were trapped until the baits had been out for almost two weeks. During the third week large numbers were taken in the C group pails, and only slightly fewer in those of B group. After the third week, however, the effecacy of the C group declined quickly, whereas that of the B group was maintained until the sixth week, when it declined very rapidly. Fermentation of the A group baits was rapid, and they were apparently not very attractive to the moths at any time during the five weeks. In the B group, which differed from the former in that the bait contained sodium arsenite, fermentation was retarded to a great extent, and these baits retained their attractiveness continuously from the second till the sixth week. Fermentation of the C group baits was fairly rapid, and they were very attractive during the third week, but during the fourth and fifth weeks they were little more effective than those of A group.

## Discussion.

There are decided day to day and week to week fluctuations in the number of moths trapped by the various baits. Several contributory factors are postulated to account for these fluctuations; they include—

(1) Variations in the attractiveness of the baits owing to changes in composition such as would be caused by fermentation and growth of moulds, &c.

(2) Overlapping of generations, or any decided demarcation between the generations of the various species.

(3) Influence of light rains on the emergence of moths from pupæ in the soil.

(4) Climatic factors and their influence on the receptivity of moths to chemical stimuli.

Very little evidence either for or against these postulations was recorded at the time of the trials.

Under the conditions existing during this experiment, a syrup of molasses and water without the addition of a preservative fermented far too rapidly to be effective. A syrup of honey and water, on the other hand, was very effective for a short period, but was subsequently little better than molasses and water. The addition of sodium arsenite to a syrup of molasses and water so improved its qualities that the syrup was an effective bait for a period of three weeks at least, even under the high temperature conditions which prevailed. The three weeks during which this syrup was effective commenced at the beginning of the third week of the experiment.

Pails raised 2 feet from the ground on stands caught more moths than those on the ground, though the percentage of loopers included in the total catch was less. The use of Quassia chips in the preparation of the honey and water syrup depressed the total number of moths trapped, without materially affecting the number of loopers included. Amyl acetate decreased the total catch including loopers, whereas ethyl acetate did not greatly affect the total but increased the proportion of loopers.

## Conclusions.

Under the conditions described, none of the baits used can be regarded as promising lures for the attraction of the corn ear worm moth. The small numbers trapped in the second experiment from a population known to be large, give no indication that baits can be successfully used in the control of the corn ear worm. A syrup composed of molasses and water and containing 0·5 oz. of sodium arsenite per gallon caught large numbers of looper moths over a period of nearly four weeks. This liquid bait may be worthy of further investigation should the looper assume greater importance as a pest of cotton in the future.

## Summary.

Baiting trials were commenced with a view to obtaining a practicable method for the control of the corn ear worm on cotton.

The baits used included molasses and water, and honey and water syrups, with the addition of various other substances such as sodium arsenite, kerosene, aqueous extract of Quassia chips, amyl acetate, and ethyl acetate. Half the pails were placed on stands 2 feet from the ground and the remainder on the ground.

None of the baits used were effective against corn ear worm, but a syrup of molasses and water containing sodium arsenite at the rate of 0·5 oz. per gallon showed promise as a bait for the cotton looper moths.

### REFERENCES.

1. U.S. Dept. of Agric., Bur. of Ento. Bull. 50, 1905.
2. Journal of Economic Entomology, XIX., 3, 1926.
3. Journal of Economic Entomology, XXIV., 5, 1931.
4. Journal of Economic Entomology, XVIII., 1, 1925.
5. Journal of Economic Entomology, XXIV., 3, 1931.

TABLE I.

MOTHS TRAPPED IN EXPERIMENT NO. 1.

| Individual Pail Modifications. | | | Moths Traaped in Five Weeks. | | | |
|---|---|---|---|---|---|---|
| Pail. | Height. | Substances Added. | Corn Ear Worm. | Looper. | Others. | Total. |
| A1 | Ground | .. | 3 | 16 | 16 | 35 |
| A2 | Ground | Amyl Acetate .. .. .. .. | 4 | 12 | 37 | 53 |
| A3 | 2 feet | .. | 1 | 21 | 27 | 50 |
| A4 | 2 feet | Ethyl Acetate .. .. .. .. | 1 | 14 | 25 | 39 |
| A5 | Ground | Kerosene .. .. .. .. | .. | 9 | 6 | 15 |
| A6 | Ground | Kerosene and Ethyl Acetate .. .. | 1 | 8 | 13 | 22 |
| A7 | 2 feet | Kerosene .. .. .. .. | 1 | 9 | 40 | 50 |
| A8 | 2 feet | Kerosene and Amyl Acetate .. .. | 5 | 11 | 44 | 60 |
| | | Group A—Base of Molasses and Water | 16 | 100 | 208 | 324 |
| B1 | Ground | .. | 17 | 222 | 137 | 376 |
| B2 | Ground | Amyl Acetate .. .. .. .. | 3 | 131 | 41 | 175 |
| B3 | Ground | .. | 6 | 204 | 54 | 264 |
| B4 | Ground | Ethyl Acetate .. .. .. .. | 6 | 182 | 44 | 232 |
| B5 | 2 feet | .. | 26 | 129 | 205 | 360 |
| B6 | 2 feet | Amyl Acetate .. .. .. .. | 12 | 69 | 110 | 191 |
| B7 | 2 feet | .. | 12 | 136 | 99 | 247 |
| B8 | 2 feet | Ethyl Acetate .. .. .. .. | 4 | 129 | 50 | 183 |
| | | Group B—Base as A + Sodium Arsenite | 86 | 1,202 | 740 | 2,028 |
| C1 | Ground | .. | 15 | 109 | 142 | 266 |
| C2 | Ground | Amyl Acetate .. .. .. .. | 4 | 30 | 57 | 91 |
| C3 | 2 feet | .. | 10 | 102 | 202 | 314 |
| C4 | 2 feet | Ethyl Acetate .. .. .. .. | 7 | 163 | 166 | 336 |
| C5 | Ground | Quassia .. .. .. .. .. | .. | 76 | 84 | 160 |
| C6 | Ground | Quassia and Ethyl Acetate .. .. | 4 | 169 | 103 | 276 |
| C7 | 2 feet | Quassia .. .. .. .. | 8 | 66 | 69 | 143 |
| C8 | 2 feet | Quassia and Amyl Acetate .. .. | 9 | 114 | 80 | 203 |
| | | Group C—Base of Honey and Water .. | 57 | 829 | 903 | 1,789 |
| | | All Pails .. .. .. | 159 | 2,131 | 1,851 | 4,141 |

### *THE JOURNAL APPRECIATED.*

*Chairman, Local Producers' Association, 26th August,* 1933, *writes:*—"*Enclosed please find 2s. for a renewal of your valuable journal for a further period of two years.*

"*I would like to say how extremely helpful the journal is to me, and is at all times a source of enlightenment on many subjects—a very real inspiration to men like myself who derive their existence from the land. . . . hoping that every country home throughout the State will soon realise its need for a journal such as yours.*"

# Seed-Harvesting Ants.*

By J. HAROLD-SMITH, M.Sc., N.B.A., Entomologist.

TOBACCO seedlings require favourable planting conditions if a uniform crop is to be established in the field; hence growers normally sow a greater seed-bed area than is theoretically necessary for the requirements of the land to be cropped. In spite of such an evident precaution, the losses in the seed-beds through various causes have frequently been so considerable that less than the desired acreage could be planted. Often the greater part of these losses has been due to the activities of several species of ants, some of which harvest the seed before germination while others nip off the seed leaves as soon as the plants appear through the ground. The species known to cause the second type of injury may also harvest the seed.

These seed-harvesting ants normally subsist on the available provender on the surface of the ground in forest country—weed and grass seeds being stored in the underground galleries of the nest for the communal food requirements of the insects. Most tobacco districts possess a rich ant fauna, and it is inevitable that when tobacco seed is broadcast over the specially prepared soil of the beds, the foraging workers immediately take advantage of the fact and industriously collect it for their own purposes. By filching the seed in this way, no seedlings appear in the beds after the usual germination period; or, should the numbers foraging be limited, an uneven strike of seedlings is the negligible result of all the efforts made in establishing and maintaining the seed-bed area. Some species, whose main colony is beyond the seed-beds, merely carry off the seeds, but others heap the seed near the openings of nests actually established in the seed-bed, and when these germinate the resulting seedlings are crowded etiolated specimens of no value to the grower. The actual loss of seedlings is perhaps of less importance than the implied disturbance in a planned programme for the planting of given acreages at a scheduled time, for failure to plant early in the year may involve a restriction in area while the success of late planted crops is somewhat uncertain.

The seed-harvesting habit is common to many native species of ants and several frequent seed-beds though not all are definitely known to remove the seed. Some are black and some are reddish-brown, but all are less than a quarter of an inch in length. The species implicated are *Monomorium* spp., *Pheidole longiceps* Mayr., *P. variabilis* Mayr., and a few unidentified forms. *Pheidole longiceps,* and possibly some of the others, may also destroy the germinated seedlings by nipping the first pair of seed-leaves from the plant. Many of these ants forage only during the cooler hours of the day; but one, *Pheidole longiceps,* seems to work continuously.

*Reprinted from "Tobacco Growing in Queensland," by N. A. R. Pollock, J. Harold Smith, and L. F. Mandelson. Published by the Department of Agriculture and Stock, 18th May, 1933.

### Control.

Though various suggestions have been made for the control of these insects few have any experimental validity. Recent work by this Department has, however, shown that losses from seed-harvesting forms may be obviated by alterations in seed-bed management which entail little additional work. Ants in their foraging operations merely search the surface of the soil for food materials, though these are ultimately stored in underground galleries in the nest. In ordinary practice tobacco seed is sown on a compacted soil surface, a method which aims at procuring an even strike of plants. By top-dressing the beds after sowing with a sand cover to a depth of one-eighth of an inch, the seeds are protected from the ravages of harvesting ants. Such a covering does not interfere with the normal germination of the plants and may actually be culturally beneficial as the root system is better established before the seed leaves appear above ground. Medium-grade river sand is best suited for the purpose, and should be applied by hand at the rate of a kerosene tin and a-half (6 gallons) per 100 square feet of seed-bed. If sand is not procurable a top-dressing of light sandy soil may be substituted. There are various objections to the latter practice, chief among which are the possible caking characteristics of the soil and contamination with weed seeds and disease organisms. But when soil covers, as distinct from sand covers, have to be used, stocks should be drawn from virgin country which has not previously been cultivated.

On some farms where adequate germination has been obtained, the activities of leaf-cutting forms present a different problem. Normally the grower is better able to observe the activity of these, and while the measures already discussed should be regarded as a necessary part of seed-bed operations, the following, designed to cope with leaf-eating ants, may be adopted only where their depredations are evident. Fluid baits have been used a great deal but not with consistently good results, and better control has been secured by recognising the garnering habits of the insects and diverting them to other food materials. A suitable preparation is obtained by mixing Paris green and maizemeal at the rate of 1 in 50 with sufficient moisture to make a crumbly mash. No more water should be used than is necessary to ensure that the poison adheres to the carrier. The bait is broadcast over the beds as soon as leaf-harvesting species appear; 12 oz. of the mixture being sufficient to adequately cover 100 square feet of seed-bed. The beds may require protection for three weeks after germination, but by that time the plants are large enough to escape attack. In very acute cases it may be necessary to apply the bait every three or four days during this period, but ordinarily one, or at most two treatments, will give control. The bait apparently is preferred as food by the leaf-garnering species, and the seedlings are thus freed from their undesirable attentions.

# THE 1933 BRISBANE EXHIBITION.

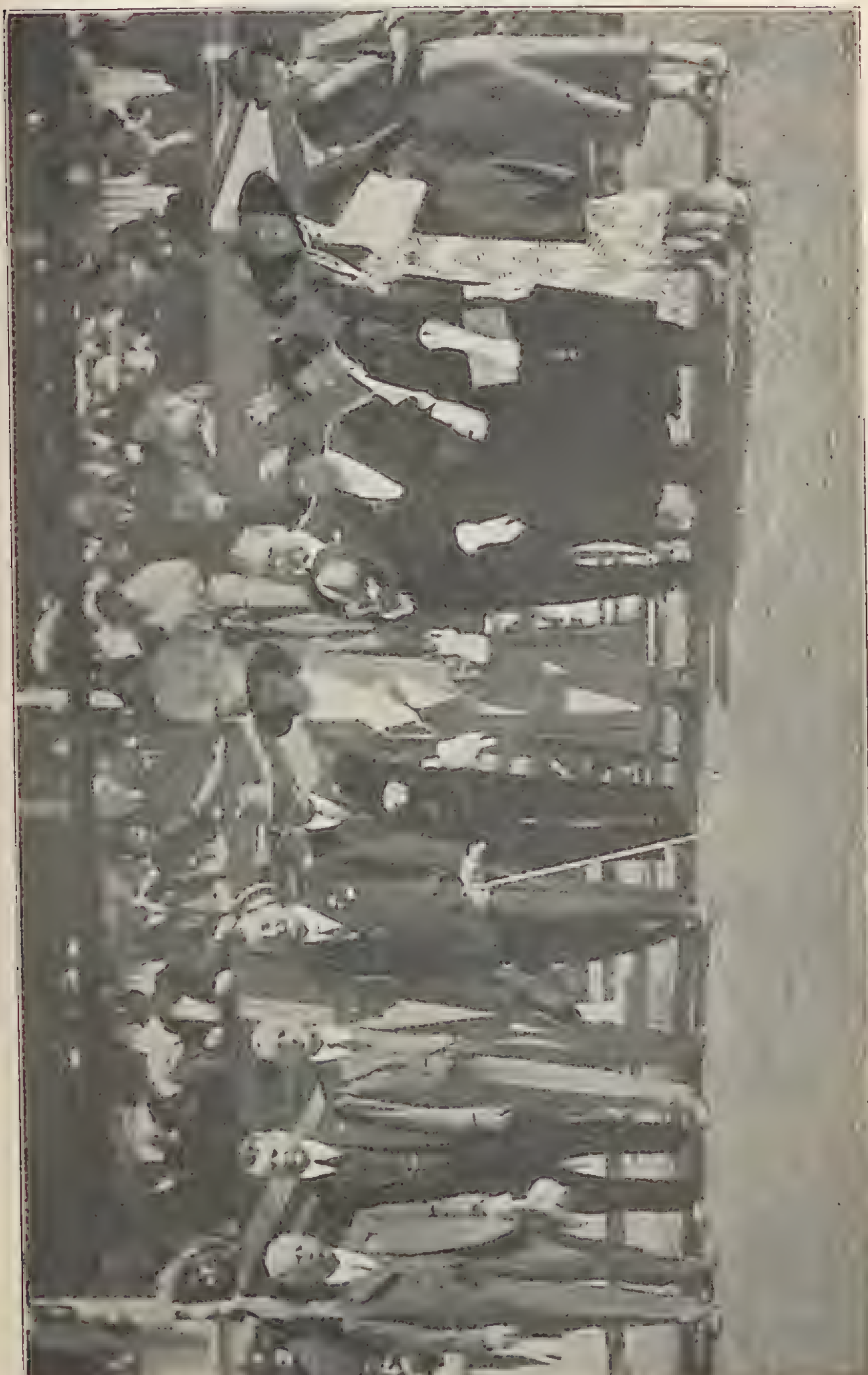

Plate 64.—On the Opening Day of the Show.

The gathering includes Their Excellencies Sir Leslie and Lady Wilson; the Premier (Hon. W. Forgan Smith) and Mrs. Forgan Smith; Hon. Josiah Francis, M.P.; Sir Donald and Lady Cameron; and the Lady Mayoress (Mrs. J. W. Greene).

PLATE 65.—A ROYAL CAVALCADE.
Aristocrats of the arena in the Grand Parade.

Plate 66.

His Excellency the Governor, Sir Leslie Wilson (left), and the Premier, Hon. W. Forgan Smith, found much of common interest at the Brisbane Show.

PLATE 67.

The Minister for Agriculture and Stock, Hon. Frank W. Bulcock (left), and a friend reflect Queensland's cheerful spirit at the Brisbane Show.

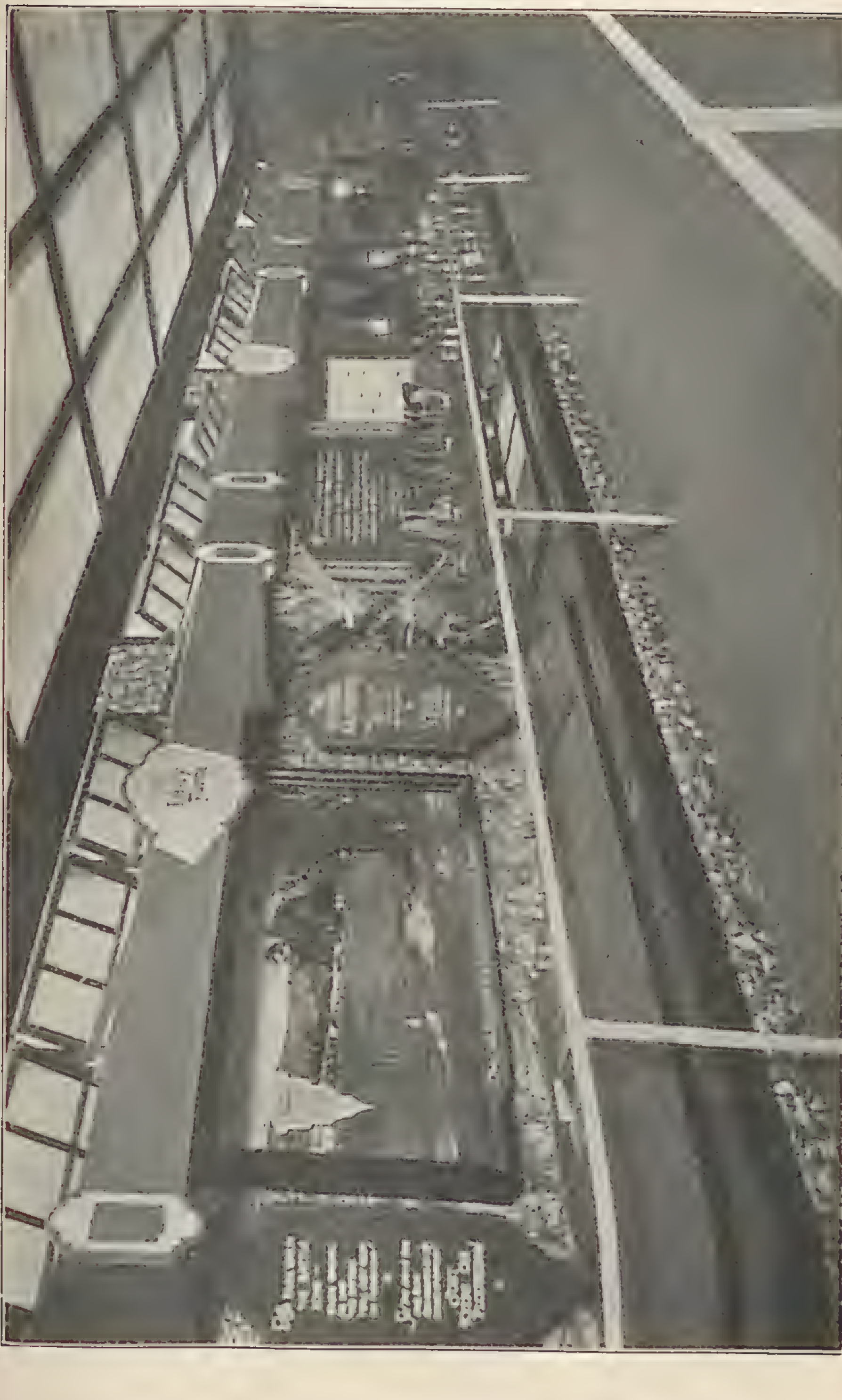

PLATE 68.—IN THE DAIRY HALL.

Dairying in Queensland now ranks with Grazing as a great contributor to our export trade. A quarter of the aggregate butter output and almost half the cheese outturn of the Commonwealth are produced on Queensland's dairy farms. The annual value of the industry now approximates £7,000,000.


PLATE 69.—AN IMPRESSIVE PANEL IN THE DAIRY HALL.
In this Departmental Display the economic importance of the Dairy Industry was fitly illustrated.

Plate 70.—In the Court of the Department of Agriculture and Stock.

A "cereal story" told eloquently in sheaf and grain—a story of Departmental effort and success in breeding wheats suitable for Queensland's great grain lands in regions of summer rainfall.

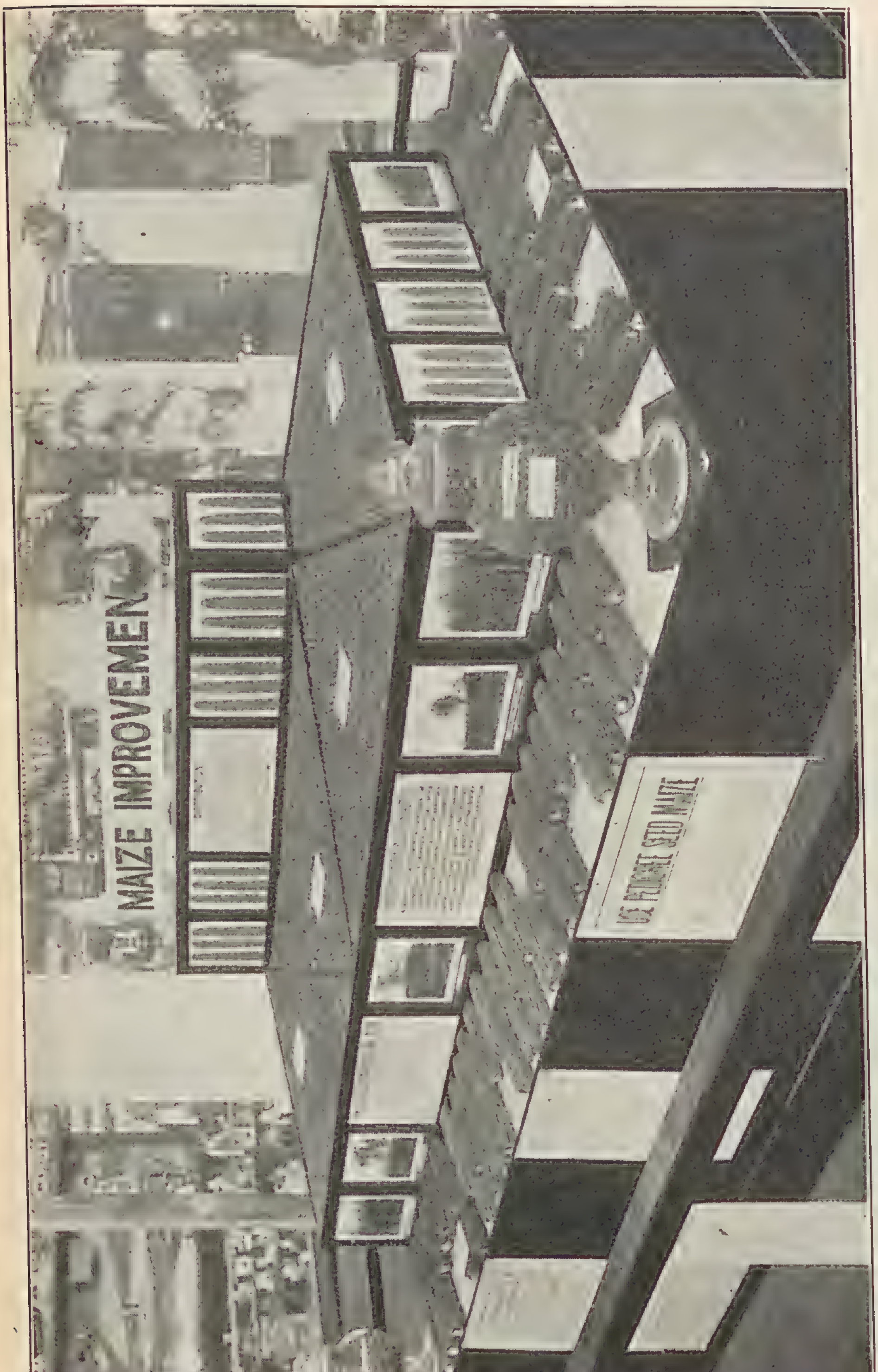


PLATE 71.—CORN WAS KING IN THE DEPARTMENTAL COURT.

This fine maize trophy at the Brisbane Show told an impressive story of the development of maize-breeding and production in Queensland. It also demonstrated the success of Departmental plant-breeders in evolving and fixing types that have quadrupled our grain yield. Maize-growing is now one of Queensland's major agricultural industries.


Plate 72.—Exhibit from the State Animal Health Station at Yeerongpilly, near Brisbane.

This section of the Agricultural Court was a centre of interest to graziers, dairy farmers, and other stockowners at the Brisbane Show. Many branches of veterinary research were illustrated. Queensland, however, is one of the healthiest stock countries in the world.


PLATE 73.—QUEENSLAND TOBACCO FOR AUSTRALIAN SMOKERS.

This panel was representative of every tobacco-producing district in the State. Queensland's tobacco lands produce high-quality leaf, acceptable alike to manufacturer and consumer.


PLATE 74.—THE TOBACCO ALCOVE IN THE COURT OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

This exhibit arranged by the Entomological Branch showed how science is interlocked with agriculture.


PLATE 75.—A WHITE MAN'S INDUSTRY IN A WHITE MAN'S LAND.

In this corner of the Departmental Court was illustrated the remarkable technical progress of the Australian sugar industry—the greatest single agricultural enterprise in the Commonwealth.

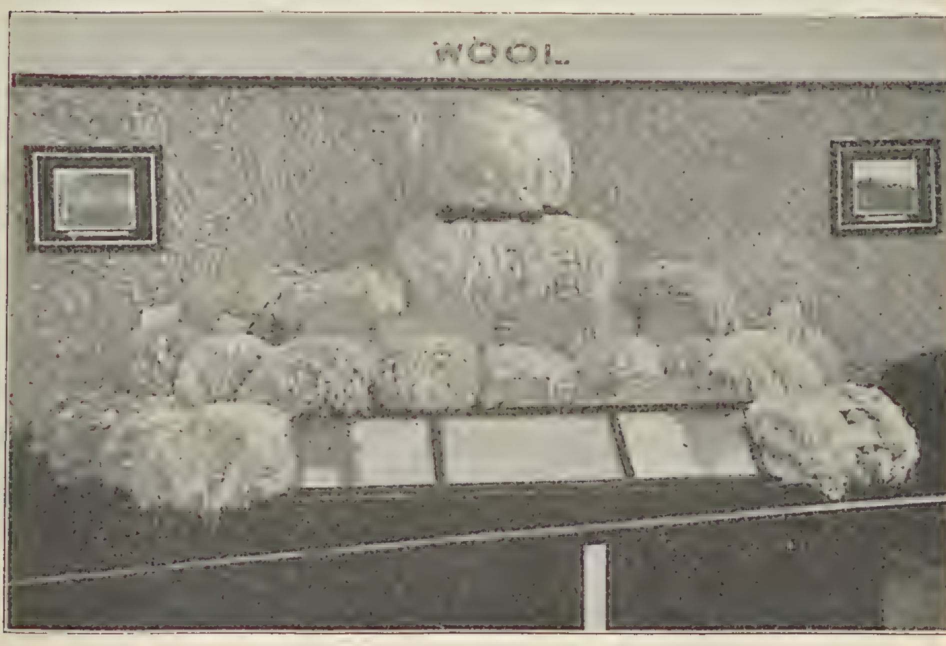


PLATE 76.—QUEENSLAND'S WEALTH IN WOOL.

Fleeces from Western flocks at the Brisbane Show, which coincided with a rise in wool prices—a bright augury of a return to pastoral prosperity.


PLATE 77.—DISPLAY BY THE COTTON BRANCH.

Cotton-growing is now well established in this State, and Queensland lint feeds Australian looms. The spinning industry is now an important factor in the economy of the Commonwealth.


PLATE 78.—THE JOURNAL AT THE SHOW.

The "Queensland Agricultural Journal" Bureau was the distributing centre of information on the activities of the Department of Agriculture and Stock—a service much appreciated by farmers visiting the Show. Mr. Eric Keehn is the young officer in charge.

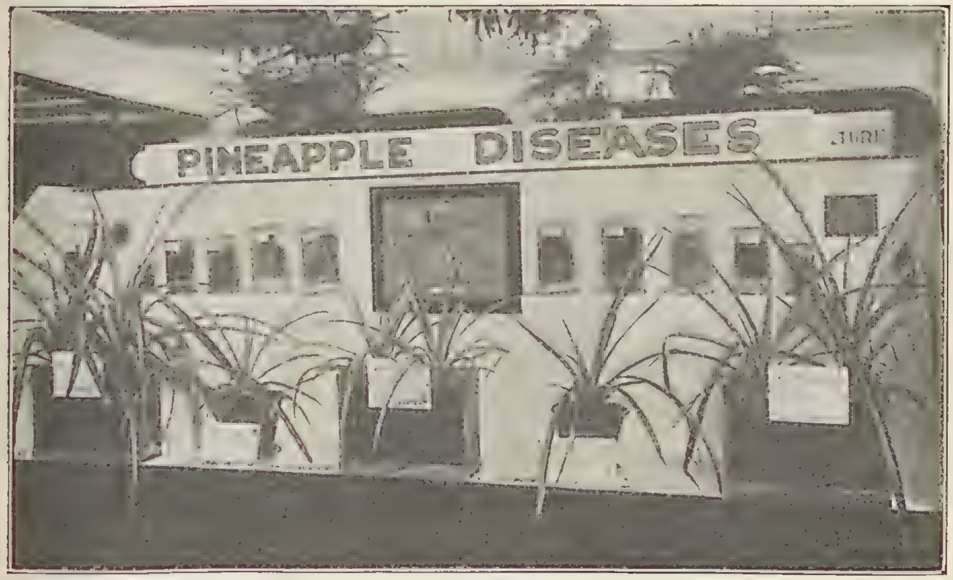


Plate 79.—Science Allied to Rural Industry.

This and other exhibits of the Entomological Branch and its Pathological Section was illustrative of the extent and value of the scientific services available to Queensland farmers.


Plate 80.—The Peanut Trophy.

Peanut-growing is now a well-established industry in the South Burnett district and Central Queensland, and is mounting up rapidly in annual value to the State.


PLATE 81.—THE FARMERS' FEATHERED FRIENDS.

Native birds as pest-destroyers have now been given a definite place in Australian rural economy.

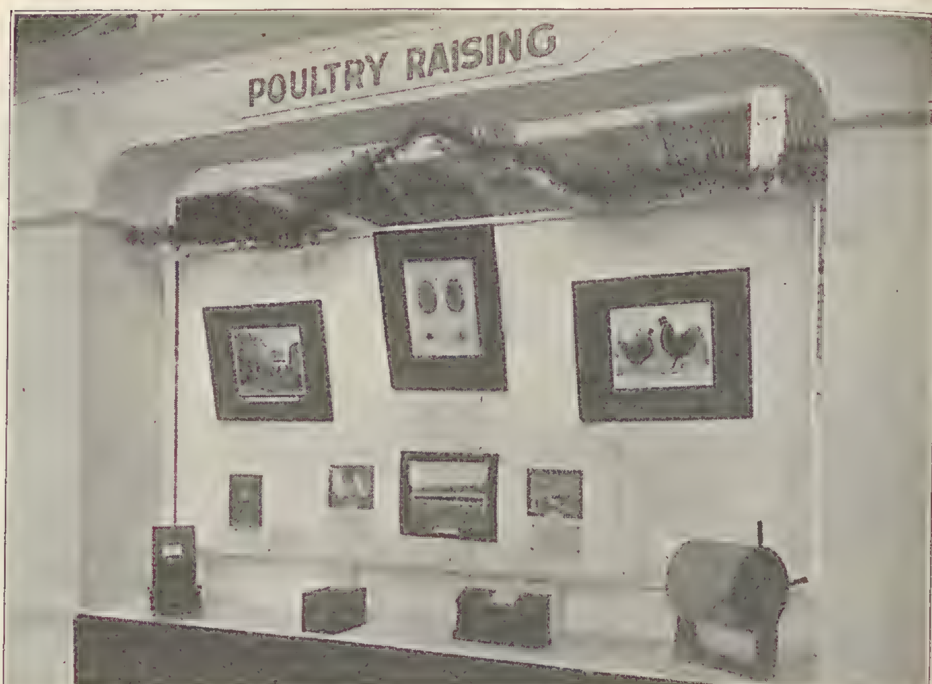


PLATE 82.—THE POULTRY PANEL IN THE COURT OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

Poultry-raising is a thriving industry in Queensland, and is progressing steadily in annual value. The egg export trade is also developing well; 1,300,000 dozen Queensland eggs were marketed in Great Britain last season.


PLATE 83.—PANELLED PASTURES IN THE DEPARTMENTAL COURT.

Probably 80 per cent. of Queensland's rural wealth is derived from rich indigenous and introduced grasses, and this exhibit illustrated their wide range and nutritive value.


PLATE 84.—A CORNER OF "THE PIGGERY," DEPARTMENTAL COURT.

Pig-raising is a well-established and rapidly-expanding Queensland industry. Throughout the year an active educational campaign is carried on, and this display illustrated the effectiveness of that work.

# THE DAIRY INDUSTRY.

## SOME COMMON DISEASES OF STOCK.

(Dairy Branch.)

IT was intended to follow up last month's article with one on feeds and feeding, but owing to the large number of queries received about diseases in cattle these notes on the economic importance of several contagious diseases have been substituted.

The diseases dealt with are responsible for enormous wastage in the primary wealth of Queensland, and this loss is borne solely by the primary producer. Much can be done by the dairy farmer to avoid this loss. It is simply a matter of knowing the cause and the remedy and taking suitable action along the lines recommended. In ordinary circumstances, each disease would justify a separate article, but owing to the necessity for early action a brief reference is made to the four major stock disorders occurring in this State. They are—Tuberculosis, Contagious Mammitis, Contagious Abortion, and Contagious Vaginitis.

### Tuberculosis.

This disease is caused by a specific germ and is transmitted from cow to cow through excretions such as coughed-up sputum, saliva, urine, and dung. Dung from infected cows infect pastures, and germs are thus taken in by animals grazing over such areas. Bails may be similarly infected, and the germs inhaled with dust in the atmosphere.

The economic importance of tuberculosis is obvious. Owing to the chronic nature of the disease the animal becomes unthrifty, and over a period of years will show a gradually diminishing return for the same expense incurred in feeding and labour. Finally the animal dies, or has to be destroyed. Destruction represents a direct loss, plus the unfavourable balance-sheet of the cow over a period of years.

The contagious nature of the disease renders the presence of a tuberculous animal in the herd a constant source of danger; the unfavourable balance-sheet of one cow may become that of several cows and finally the whole herd.

It must be remembered that infected milk from a tuberculous animal is going to produce the disease in young stock and pigs fed with such milk.

There is no known cure for tuberculosis, so activities must be directed towards the elimination of all infected animals from the herd. It is not possible to definitely diagnose tuberculosis from the external appearance of the animal, though any beasts noticed to be coughing, showing swollen glands, or are more unthrifty than the rest of the herd should be regarded as suspicious cases. Positive diagnosis is made by means of the tuberculin test, and any farmer suspecting the presence of the disease should communicate with the Department of Agriculture to arrange for tests to be carried out.

All tuberculous animals should be culled from the herd.

### Contagious Mammitis.

Contagious mammitis is caused by a specific germ, but infection is often complicated by the presence of more than one strain of organism. In most cases, infection occurs through the germs gaining access to the udder by way of the teat canal, and is transmitted from cow to cow by machines, and milkers' hands that have come in contact with infective milk. According to the type of mammitis present, so is the economic aspect of the outbreak likely to vary. In a case of sudden onset within a few days of calving (udder hot and swollen, milk curdled and discoloured, lameness, loss of appetite), associated with infection of the womb, the case is likely to end fatally within anything up to four weeks. In any case, the affected quarter or quarters never function again. Thus it will be seen that such an attack is likely to result in the loss of the beast and at least a permanent reduction of return from that cow, though production costs remain unaltered.

Other cases of mammitis are likely to develop at any time during the lactation period; they vary from acute to chronic cases, depending on the treatment adopted. A cow may be affected suddenly, showing similar symptoms to the previous type, but without the complication of womb infection. This type results in a marked decrease of milk production for at least one lactation period, and if proper treatment is not adopted the case will become chronic. As a result, the milk secreting tissue of the udder is replaced by hard fibrous tissue, and the animal finally becomes useless as a production unit.

Production recording figures for 1932 show that the average return per cow for the year was £10 6s. 3d., so depending on the extent of infection, corresponding fractions of that amount will be lost for every cow affected with mammitis. Obviously the better the type of cow affected, so will the loss increase. If the disease is to be kept under control, the farmer must be thorough in treatment—any half-hearted measures will not yield favourable results. Treatment may be considered under the heading of Individual and General.

**Individual Treatment.**

Dealing with those cases immediately following calving, individual treatment must be directed largely towards the womb. The use of iodoform pessaries gives excellent results. Hot fomentations applied to the udder to reduce pain and swelling, and judicious use of autogenous vaccine, if it can be secured in time, will prevent the spread to other quarters. Though complete recovery cannot be hoped for, still the life of the animal can be saved and destruction of the udder tissue kept down to a minimum.

Ordinary acute cases not associated with calving respond well to treatment and may result in complete recovery, and it is with such cases that the farmer will be fully repaid for all his efforts to combat the disease.

When the condition is noticed, give a good laxative drench followed by a restricted ration. Hot foments will reduce pain and swelling and massage of the udder, combined with two-hourly milking out of all quarters, will prevent hardening of the udder and will cause clots and discoloration to disappear from the milk. The judicious use of autogenous vaccines is of great value in bringing about this recovery.

Without thorough treatment these cases will develop into the common chronic conditions in which extensive hardening of the udder is present. These advanced cases rarely respond to treatment, and the best place for animals so affected is the butcher's yard.

**General Treatment.**

All the treatment described, including vaccines, is so much waste of time and money if proper attention is not paid to general hygiene and the management of affected cattle.

Milk all affected cows last to prevent the spread of the disease to clean cows by machines or milkers' hands. Do not transfer a seemingly cured case to the clean portion of the herd until a microscopic examination of milk samples has proved the animal to be non-infectious.

Infective milk must be disposed of in such a way that it cannot infect bails, utensils, leg-ropes, or any other article of plant or equipment. Do not simply strip out on to the floor; such a practice is dangerous. Keep machines and utensils thoroughly clean, paying particular attention to any article that has come in contact with contaminated milk. Machines properly cared for will not cause mammitis, but the farmer who neglects this will quickly find himself with contagious mammitis widespread throughout his herd.

**Vaccines.**

Contagious mammitis vaccine may be secured from the Animal Health Station, Yeerongpilly.

*Scale of Charges.*

| No. of Animals. | Charge. s. | d. |
|---|---|---|
| 1 | 2 | 6 |
| 5 | 6 | 3 |
| 10 | 10 | 0 |
| 20 | 16 | 8 |
| 25 | 20 | 0 |
| 40 | 30 | 0 |
| 60 | 40 | 0 |
| 80 | 46 | 8 |
| 100 | 50 | 0 |

There are two classes of vaccine, although both are prepared in exactly the same way, the difference being that the *autogenous vaccine* is definitely prepared from the particular strain of germ affecting the animals it is proposed to treat. To prepare such a vaccine, a small sample of the strippings from the affected quarter of the cow must be sent to the Animal Health Station. This should be forwarded in a clean bottle, without preservative.

If the vaccine prepared in this way were sold for use in another herd it would be classified as a *stock vaccine*, or, in other words, one that is kept in stock or on hand.

Either may be secured from the Animal Health Station at the foregoing rates. A few days are required to prepare the autogenous vaccine which will remain potent for about six months.

The vaccine is injected into the loose subcutaneous tissue behind the shoulder in the same way as tick fever innoculation is performed, and the ordinary 10 c.c. tick fever innoculation syringe and needle are necessary for the operation.

Full instructions are supplied from the Animal Health Station.

**Contagious Abortion.**

This is another disease caused by a specific germ and rendered more important by reason of its contagious nature.

Clean cattle become infected by grazing on pastures that have been contaminated by the ordinary discharges and after-birth of affected cows. Occasionally the disease is transmitted by a bull serving a cow showing infective discharges, and then serving a healthy cow.

It is not difficult to realise that contagious abortion in a dairy herd can be responsible for large losses. In the first place, when a cow aborts, the farmer loses what may normally have been a valuable calf, and the infected cow is idle over a period which should have been productive. Again, contagious abortion is definitely connected with temporary and permanent sterility, often being the cause of that aggravating "return to the bull."

When a cow is affected with the disease there is a great likelihood that she will not clean properly, resulting in serious inflammation of the womb, which may even lead to the death of the animal.

Considering the losses likely to be suffered, and the fact that if affected animals are not culled from the herd contagious abortion will continue to worry the farmer every year, it is obvious that the disease is one that cannot be lightly considered.

There is no known cure for contagious abortion and preventative or curative innoculation is valueless, and even dangerous in a country where it is possible to eliminate the disease.

In the control of contagious abortion care must be exercised in the destruction of all infected discharges, after-birth, and aborted calf. Thoroughly wash all parts of the cow stained with discharges, using a disinfectant solution. After-birth and the aborted calf must be collected and burnt. Any fodder, &c., noticed to be contaminated by discharges should be similarly dealt with. Elimination of affected cows from the herd is the most certain way to control the disease.

Definite diagnosis is obtained by the testing of blood samples from infected cows. This blood test is carried out by the Department. Sometimes abortion occurs at such an early date in the development of the calf, that its occurrence may not be noticed. When a cow that is supposed to be in calf shows a sudden return of "heat" periods, the farmer should suspect that abortion has occurred, and it is advisable to arrange for the testing of such cows.

A cow infected with contagious abortion may slip one calf and then carry all subsequent calves to full time and calve normally. This explains the many claims often made for various "cures" of the disease. Such cows are a menace because, though unsuspected, they are capable of spreading the disease as the discharges and after-birth are infective, even though calving is normal. Considering this point, it is advisable to have all stock tested before introduction into a clean herd.

**Contagious Vaginitis.**

Contagious vaginitis is caused by infection of the vagina, with various strains of organisms. The spread of the disease is to a large extent brought about by the bull serving an affected cow, and then a clean one. Careless handling and examinations of the vagina are a big factor in original infection and spread of the disease.

The economic importance of contagious vaginitis is in its being a cause of temporary sterility of dairy cattle; the general health of the cow is rarely affected.

The continued return of the cow to the bull is responsible for greater loss to the farmer than is at first apparent. Take the case of a cow that requires three visits to the bull before she becomes pregnant. This means that she will be idle for six weeks longer than normally, actually a loss of the amount that cow would

return in six weeks. Consider the fact that several cows may be so affected, some requiring more than three services, others remaining permanently sterile, and it is not difficult to realise that contagious vaginitis is responsible for many reduced monthly cheques.

Diagnosis of the condition is not difficult. Thick, tenacious, glassy, discharge will be noticed coming away from the cow; this usually clears up in a day of two; then on opening the lips of the vulva it will be seen that the membrane of the vagina is studded with tiny nodules, varying from reddish to a yellowish grey colour. These exist for a variable time, days to months, after the discharge has ceased.

Treatment consists of douching the affected cow three times weekly with a solution of Condy's Crystals, using one gallon of water and sufficient Condy's to produce a violet colour. About half an hour before the cow is put to the bull irrigate the vagina with a 1 per cent. solution of bi-carbonate of soda—a heaped dessert-spoonful to a quart of water.

It must be remembered that the bull is likely to contract infection, and periodical inspection of the sheath and penis should be made.

In control of the disease care must be taken that in any examination of cows, the hand and arm are thoroughly disinfected, and any instruments must be disinfected after use on one cow, and before proceeding to examine the next.

Nutrition is a factor that must be considered in treatment and control of disease. If a properly balanced ration is not fed to the herd there is little chance of thoroughly eliminating any of the diseases described. Therefore, pay every attention to correct feeding, when formulating a plan for disease eradication.

A worth-while slogan for the farmer to remember is

**"Breed, Feed, and Weed."**

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## IS PRODUCTION RECORDING WORTH WHILE?

WHEN one considers that last year only 300 dairy farmers out of approximately 25,000 took advantage of the free facilities offered by the Department in the testing of their herds for production, it is plain that there is some reason for the neglect of the others to take advantage of the scheme. It is also apparent that there are only two reasons which can be advanced—namely, that they either did not know of the scheme, or that they did not consider it worth while to test.

Now, there are very few who will confess the former, for it has been broadcast for years and years, leaving little doubt that at least 90 per cent. of dairy farmers have known about it. It is, therefore, conclusive that most of them consider it to be not worth while. Has the matter been really seriously considered?

### The Object of the Practice.

The whole object of production recording is to determine the low producing animals in a herd with a view to culling them, and likewise to find out the high producers from which to breed.

Let us go through these phases systematically, and we find that they represent the beginning and the end of dairy farming.

Dairy farming is not a matter of milking cows, separating the milk, forwarding the cream to the factory and the separated milk to the pigs. It is an occupation that calls for intelligence of a high order to command success, and the return is commensurate with the amount of intelligence displayed in the conduct of the business, just as in the commercial world. Think over that statement. It is not inferred that a college education is necessary, for the power of thought is within the reach of all; and in this State we have assuredly as high an order of intelligence among our primary producers as may be found anywhere else in the world.

### Successful Dairying Connotes Keen Business Faculties.

Dairy farm practice quite definitely involves keen business management, and we shall take stock of the position from that angle.

Consider your investment! What did your farm cost, or what is it worth? Say, £5 an acre without your buildings. Let us estimate your safe carrying capacity as 3 acres to the beast, which represents £15 worth of land for each animal. How many lots of £15 are lying idle and producing nothing, or how many cows have you on agistment? Do not answer "none," because if you have never tested you do not know how many are eating your grass and giving you only 1s. a week for the privilege, to say nothing of the additional half hour's work a day in yarding and milking them. You are probably good enough also to give them two good meals a day, which took you some time to prepare. We would recommend that you test to find out how many of these "boarders" you really have. There is no other reliable method, for you cannot determine the quantity of fat in the milk without the Babcock tester. To estimate only the quantity of milk produced is futile, for there is likely to be a considerable variation in the fat content. It has been demonstrated over and over again by herd recorders that what was thought to be one of the best producers was in reality an inferior producer of fat. Your best milk-producing cow may have a very short lactation, whereas your other animals may have the capacity to carry through a full nine months' period. Without keeping records these facts cannot well be remembered.

This leads us directly on to the matter of producing characteristics, but in order to make our points thoroughly clear we would like to broadly review breeding principles for the benefit of those who have not made a study of the question.

### Points in Breeding.

The whole principle of breeding is based on the Mendelian theory that like begets like. Now this must not be considered to be without exception, for the facts concerning reproduction show clearly the possibilities of variation.

It may probably be best explained in this way: The calf is developed by the union of a male cell with a female cell, both of which contain the characteristics of the parents. Thus each joint cell, or the embryo calf, contains two sets of characteristics, one from each parent. It is obvious that the progeny, however, can show *only* one characteristic in each direction, whether it be in the shape of a part of the body, the functioning of an organ, or a quality. All of these characteristics which are noticeable are termed "dominant," while the other corresponding characteristics which are hidden are termed "recessive." In the next generation it may happen that some of these "recessive" or hidden characteristics become "dominant," and thus we find what are termed "throwbacks." By exercising care in the selection of parents, however, it is possible to ensure the transmission of desirable characteristics to the offspring to a remarkable degree, as the young calf can show only the characteristics it inherits either through its parents or grandparents.

Take, for instance, the quality of milk production. If the dam and grand dam had this quality highly developed and the sire also inherted this quality the progeny can inherit only the same characteristic. Thus it is necessary to mate only the best producing cows in the herd with a bull from a similarly good production strain, if it is desired to build up a herd of good producing females.

You will also have observed from the foregoing that the bull is without doubt half the herd, for his set of characteristics is transmitted to each of the progeny. The better producing quality the bull inherits, the better will this characteristic be in his offspring—provided, of course, that the constitution is sound. This subject of breeding is a big one, and it shall be dealt with more fully in future notes, which will explain how to effectively ensure the transmission of desirable qualities from a generation to subsequent generations.

### "Star Boarders" a Hindrance.

In the meantime, let us return to the cows we have on agistment. We can see clearly that these star boarders are a hindrance. They have to be fed for no return; they take up the room of a good cow which would help to keep you, while even their progeny, no matter how good the bull, are sure to be 50 per cent. duffers. They merely transmit their non-producing characteristics. The characteristic which we wish to transmit is the ability to produce well for at least nine months. We do not want an animal that dries off after six months. That is the characteristic of beef breeds.

If the influence of feeding is not mentioned at this stage, it will result in no end of discussion. We must admit quite definitely that a cow will not milk to her inherited capacity unless she is properly fed and nourished, but it should be noted

most clearly that no matter how well you feed one of these star boarders she will never produce her keep in butter-fat. It should also be remembered that during the summer we have generally an abundant supply of the cheapest of fodders available—pasture grasses. Have your cows inherited the ability to make the most of this fodder, or have they inherited the ability to produce only enough to rear a calf, no matter how plentiful and luscious the pasture?

There is only one way to tell, and that is to keep records. Without records we are working in the dark. Without exercising ordinary business methods, we are working haphazardly and cannot place our finger on our leakages.

We must eliminate these non-productive units if we do not wish them to starve us out.

With the prevailing low prices overseas for our dairy produce, and the likelihood of their remaining at a lower level than that experienced during the post-war years, it is essential that we take stock of the position. We must increase the productive capacity of each unit in the herd, and so enable us to show a margin of profit from each cow in the bail.

We have heard much about over-production, but that will be dealt with in further notes on marketing. Suffice it to say at this juncture that much was made of the matter at a period of extraordinary production throughout the dairying countries, which unfortunately coincided with an acute period of under-consumption due to a world-wide financial depression.

There does not appear to be any outlook, however, for the dairy farmer who is content to keep cows for the price of an agistment fee.

## HERD RECORDING—A FREE SERVICE.

The herd recording scheme of the Department of Agriculture and Stock is a service absolutely free of cost. The Department defrays all costs, including the railage on bottles; so that the dairy farmer has not even to pay one penny. Recently the Department approached the butter factories in various parts of the State and secured their whole-hearted co-operation in carrying out this work. In many centres the actual testing is carried out by the factory, the results being posted to the Department so that a production chart may be issued at the end of the lactation of each animal. No dairy farmer can afford to neglect to record, if he desires to make a success of his business. Every State or country in the world charges varying sums up to 6s. per cow for the service, which is readily availed of by all progressive dairymen. In Queensland this service is free to the dairy farmer.

Herd recording will determine the respective value of each animal in the herd. This information will enable the dairymen to—

1. Cull out the unprofitable animal.
2. Reserve the females from the high producing animals for replacements in his herd.
3. Determine the blood lines of the sire that will beget daughters whose production figures will exceed those of their dams.

The butter-fat producing power of the cow should be inquired into, just as the horse power of your farm engine. Such knowledge increases efficiency. To take advantage of the scheme during the coming season, just hand your name in to the dairy leader of your local producers' association, and arrangements for recording your herd will be promptly made.

## SEED MAIZE SOLD.

**Maizegrowers are advised that stocks of all varieties of seed maize as advertised for sale from the Department of Agriculture and Stock, Brisbane, in the July and August issues of this Journal, have been sold out.**

**The Department has had to meet an exceptionally heavy demand for seed maize following on the winter rains and the display of stud seed maize in the Department's Court at the recent Brisbane Exhibition.**

# THE CALF—CARE AND TREATMENT IN HEALTH AND DISEASE.

By J. A. RUDD, L.V.Sc., Department of Agriculture and Stock.

IT is not possible to treat this subject as exhaustively as it should be dealt with in this treatise, as the subject is too wide to be dismissed with the few observations that are herein contained, but the following will assist those interested in the rearing of calves to assist themselves.

Perhaps few young animals are subjected to greater vicissitudes during their early lives than the progeny of the modern dairy cow during the first few months of its existence. Generally, the calf no sooner sees the light of day than he is either bereft of all maternal care by being forcibly removed from his mother, or he is unscrupulously knocked on the head as being useless and unwanted, he having served the purpose of the average dairyman, in that his birth was to a large extent responsible for his dam freshening for another season. But if he is kept alive this to a large extent depends on the average dairyman's estimate of his mother, which is generally faulty, inasmuch as she is seldom judged by her record of butter-fat, but chiefly by the quantity of milk she yields and her general condition at the end of a very bad season. If the calf has been born in a back paddock he may chance to have his dam's fostering care for a few days, and if the calf succeeds in hiding he may continue to have a few more days with his dam, but this may terminate very abruptly, for his mother may be removed and the infant calf left to starve and die without maternal protection.

The above is only one side of a picture, as it depicts the healthy calf born of average healthy parents fortunate to be free of transmissible disease.

The other side depends largely on the health of both parents, and no matter how much care is at times bestowed on such offspring, if they survive the first few months of their lives, at the best they are miserable specimens of their particular breeds, even if they reach maturity. This is a provision of nature in order to maintain a healthy virile race of cattle, and amounts to survival of the fittest.

Under this category may be placed calves born of parents affected with the following:—

Contagious abortion.
Contagious vaginitis.
Tuberculosis.
General lack of virility due in part to (*a*) unclean condition of the uterus at the time of conception; (*b*) weakness, either hereditary or acquired on the part of either or both parents at the time of conception.

*Contagious Abortion.*—Full-time calves born of parents which have established a relative immunity to contagious abortion are generally born either with white scours or septic pneumonia of calves. White scour under these conditions is difficult to treat, and if curable and the animal survives to reach maturity is, in my experience extending over some years, at the best a fitful breeder and can never be depended on in this way at any time during its active life when it is generally supposed that the animal should have no trouble in reproducing its species. The cause cannot be explained. Calves which are affected with septic pneumonia seldom survive the disease and generally succumb in spite of all care and attention. This, of course, does not always apply to calves born of relatively immune parents and fed on milk of cows which are not contagious aborters, but applies even then as exceptions in the main.

*Contagious Vaginitis.*—Calves born of such parents may be weaklings at birth, and as such are predisposed from the inception, but this does not always hold true; but as a general rule they are subject to most ailments, and succumb before they are three months old.

*Tuberculosis.*—Calves born of such parents can be quite healthy, and if removed at birth or soon after and not fed on the milk of their parents after the first few days do well; but there are examples of animals not being quite up to the mark at times, particularly when either or both parents are affected with generalised tuberculosis commonly called galloping consumption in human beings.

General lack of virility due in part to unclean conditions—

(*a*) Of the uterus at the time of conception;

(*b*) Weakness inherited or acquired on the part of one parent or both at the time of conception.

*General lack of virility.*—This may be due to lack of phosphates in the soil on which the cattle were being depastured at the time the calf was carried in utero. This causes a lack of nerve tone in a flaccid uterus, and the retention of placenta or cleanings follows, and if this placenta is not completely removed and the uterus cleansed or only part cleaned the succeeding calf, if the cow does conceive, cannot be a healthy calf, as the uterus or calf bed was not quite clean at the time of conception; but this does not always follow, and in every well-defined case there are always exceptions which, in a good measure, prove the rule.

In order to remove the placenta, give the following drench:—

| | |
|---|---|
| Epsom salts | 12 ounces |
| Carbonate of ammonia | 1 ounce |
| Powdered gentian | 1 ounce |
| Powdered ginger | 1 ounce |
| Treacle | 1 lb. |
| Water | 1 gallon |

Drench after a twelve hours' fast.

After placenta has come away flush the uterus for seven days with 20 grains of permanganate of potash to 1 gallon of water.

Flush with gravitation and not with a force pump, and always wait for twenty-four hours after the placenta has been voided before flushing.

*Weakness inherited or acquired on the part of one parent, or both, at the time of conception.*—Inherited weakness has already been dealt with. Acquired weakness is due partly to the hard, unnatural conditions under which both parents have at times to struggle. The intensity of this varies, and is in direct ratio with the ability of the owner to withstand the effects of a devastating drought. A first-class dairy cow is always in profit, whether she is milking or not. This fact is often lost sight of, with dire results to both parent and offspring. The bull is often turned out with the herd, and before the season has closed he has lost a good deal of his virility, and with it his prepotency, and his ability to produce virile offspring is in direct ratio to the method by which he was treated during the season. The dairy bull should not run with the cows, but he should be enclosed within a strong bull paddock and the cows turned into him for one jump when in season.

The foregoing deals chiefly with methods of prevention, which are more important than the curing of the sick and indigent. Prevention of disease should be the motto of every dairy farmer. The curing of the sick, although helpful, is not a very profitable form of occupation, as a certain amount of intense training is necessary before this can be successfully accomplished by the ordinary man on the land, who has little time at his disposal for this particular form of diversion, but who can prevent almost all his troubles by being trained to recognise certain well-established rules in dairy hygiene. Assuming, however, that a calf is born healthy of average healthy parents, he should go through life without a hitch, but, unfortunately, through faulty methods of treatment and feeding, he is predisposed to diseases which are only contagious when everything is favourable to their development. The ordinary healthy calf should run at least four days with his mother, after birth, and this holds good for both dam and offspring. Both have been so intimately connected for nine months that it is harmful for both to make a sudden and rapid separation, for which there is no necessity. The sucking of the calf contracts the calf bed or womb rapidly, in forty-eight hours, and at the same time enables the calf to develop from his mother's milk in his own system, which assists him to fight all diseases for at least six weeks of his life. Removal from the dam after the age of four days should be followed by being starved from twenty-four to thirty-six hours, and fed on his dam's fresh milk for fourteen days thereafter. Half whole milk and half separated skim milk for another fourteen days, and during the fourth week the addition of one tablespoonful of raw linseed oil to every three quarts of half-and-half mixture, which should be six quarts daily divided into two feeds. At the end of the month he could have three quarts of skim milk in the morning and three quarts of skim milk at night, with one dessertspoonful of raw linseed oil night and morning until he is two months old, when he gets, in addition, one dessertspoonful of finely-ground maize meal to every three quarts of skim milk, and he also picks up a little grass and looks for clean, wholesome water, which should be drawn from a well, spring, or creek of running water. Water from a dam which drains the whole paddock is a positive menace to the health of the young calf, and is probably the source of parasitic invasion. Assuming, after all this care and attention, a calf becomes infected with disease—look for the cause. Do they suck each other after feeding? Blind teats in newly-calved heifers and impotent young bulls have been caused by this grave fault. The remedy is prevention, and the only method which

is truly effective is to build bails so that each little calf will have his own bail for feeding and his own half-kerosene tin container for his milk. Twenty bails will feed 60 calves more easily and quickly than slip-shod methods of single-hand bucket or tub feeding. Twelve bails will also serve the same purpose. In spite of all these precautions, a calf might become out of sorts and, gradually growing worse, diarrhœa, blood scours and white scours develop. Isolate the calf and give him one or two tablespoonfuls of crude castor oil according to size and age, and starve him for twenty-four hours with ample water beside him, and keep him tied up under cover, with a good bed to lie on.

Second twenty-four hours: Feed him on boiled barley water, three quarts after having administered one teaspoonful of paregoric in two tablespoonfuls of water.

Third twenty-four hours: One teaspoonful of paregoric in a tablespoonful of water and six quarts of barley and fresh, new milk half-and-half for the day.

Fourth twenty-four hours: One teaspoonful of paregoric as on the previous day and six quarts of barley water and new milk half-and-half.

Fifth twenty-four hours: Skim separated milk and new milk half-and-half.

Sixth twenty-four hours: Six quarts of skim milk, new milk equal parts for the day with one teaspoonful of raw linseed oil mixed with one teaspoonful of lime water.

Seventh twenty-four hours: Six quarts of skim separator milk and one dessertspoonful of raw linseed oil and a dessertspoonful of lime water divided into two feeds for the whole day. Lime water to be made as follows:—

Place 2 or 3 lb. of slaked lime in a kerosene tin and fill up with rain water. Stir well and allow it to settle. After allowing twenty-four hours for this solution to settle, pour off the lime water, taking care not to disturb the precipitated lime at the bottom of the tin. Equal parts of lime water and raw linseed oil stirred up and agitated will make an emulsion which will be very useful for feeding calves.

Do not bring neighbours' calves into your mob, even if you get them as a present, as, although your calves can resist existing strains of disease in your own herd, because their systems have built up against them, they cannot resist existing strains in your neighbour's herd for which they have not built up anti-bodies.

Do not turn your calves out into the same paddock with the dairy cows. Do not turn them out into a back paddock for weaning, as it gives them a bad start in life. They should not leave the home paddock in which they have been running whilst they were on the bucket until they are at least nine months old.

## STABILISATION OF BUTTER PRICES.

IN the course of a recent Press statement, the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) said: "My attention has been drawn to a statement made by the Minister for Commerce (Mr. F. H. Stewart) in which he accuses me of having said that the Federal Government have been inactive in the stabilisation of butter prices. Quite obviously, my reply to a question directed to me in the House by Mr. E. B. Maher, M.L.A., has been mutilated in the Sydney Press. What I did say, as reported in 'Hansard,' was that enabling legislation depends upon the attitude of the Commonwealth Government. This, in effect, means that while the various States of the Commonwealth may be willing to pass legislation, such legislation would not be operative until sanctioned by the Commonwealth Government. As far as Queenslaid is concerned, our legislation is ready, and certain of the other States have also prepared legislation. At the present moment there is a suggestion that the several Ministers concerned meet in conference to discover the common basis that is desirable, and that viewpoint was expressed by Mr. Stewart when I met him in Brisbane recently. It is true that the Commonwealth Government either refuses to pass legislation or agrees to pass it, and to that extent the Commonwealth Government control the situation, as no State can act independently of the Commonwealth. At the present juncture, considering that certain States have not yet adopted the principles of butter stabilisation, it would be unfair to suggest that the Commonwealth Government is causing delay. I rather imagine that Mr. Stewart's remarks should be directed towards my questioner (Mr. Maher), who, by way of interrogation, suggested that failure to stabilise butter until the last minute reposed on the Legislature."

# A TALK TO SHEEP FARMERS.

J. L. HODGE, Instructor in Sheep and Wool.*

THE Department of Agriculture and Stock is at all times ready and willing to help the man on the land with his problems. We feel that these activities are not generally known, and, where known, are not sufficiently made use of. No matter what the problem is, a specialist is ready to cope with it. We welcome correspondence on any subject appertaining to the land or stock and, in addition, where possible, and if considered sufficiently important, an officer is detailed to make a personal inspection.

As far as sheep and wool are concerned instruction is given in woolclassing at the sheds if desired, as well as attention to all ailments in sheep, and the Department is ready at all times to do anything to advance further the interests of the grazing industry, both in the interests of the State as a whole as well as in the interests of the individual grazier.

## External Parasites in Sheep.

These consist of lice and ticks in sheep, both of which, if allowed free play, do incalculable harm to the wool clip, besides debilitating the animal itself in no small measure.

The only remedy lies in dipping, and in this connection the utmost care should be exercised in the choice of the material used. It definitely pays to use a good dip, and one having been decided upon, particular notice should be taken of the manufacturers' recommendations as to mixing. The correct time to dip, when practicable, is from a month to six weeks off shears.

When prices for wool are anything like normal, dipping is a payable proposition; apart altogether from the extermination of external parasites. The cost of the operation should be more than returned by the increased price of wool. Dipping, too, has its points as a deterrent to blowfly attack.

## Internal Parasites in Sheep.

The common internal parasites are stomach worm (*Hæmonchus contortus*), nodule worm (*Oesophagostoma columbianum*), and tape worm (*Tænia expansa*).

Early symptoms should be detected in the flocks by way of avoiding a heavy infestation. Sheep sometimes for no apparent reason lose condition, develop a hump in the back, sometimes scour, the membrane of the eye and nostril becomes noticeably white, likewise the skin. There is an inclination to lag behind the flock, and lie down with the head stretched right out.

Post-mortem examination will reveal the presence of the stomach worm in the fourth stomach. The nodule worm's presence is shown by cheesy-like pimples or nodules along the whole of the gut, hence the name sometime applied—"knotty gut."

The tape worm will be found along a great length of the bowel and, in some cases, attains great length, sometimes as much as 12 feet.

The remedy in all cases of worms lies in systematic drenching with one or other of the following specifics:—(*a*) Epsom salts, arsenic; (*b*) Epsom salts, arsenic, and bluestone; (*c*) bluestone and mustard; and (*d*) carbon tetrachloride.

All four drenches have their particular uses. In severe cases, I favour the arsenic and Epsom salts drench with the addition of bluestone, mainly on account of the fact that it is more likely to act on all worms.

Some people have a prejudice against the use of arsenic, but long experience has taught us that this prejudice is groundless. In the doses prescribed the effect is more tonic than destructive.

Arsenic and Epsom salts is a good drench where stomach worms or tape worms are present. Bluestone and mustard, too, is a proved drench, and in respect of this specific it is well to mention that as the drench is 4 oz. as against 2 oz. of the others, additional care should be taken in its administration. With inexpert hands the drench is likely to find its way to the lungs, pneumonia resulting.

Carbon tetrachloride given with a syringe or gun with 2 c.c.s. and 3 c.c.s. of paraffin oil has proved effective in the case of stomach worms, but has definitely been proved to have no effect on other worms. On thing in its favour is the fact that it may be used without starving the sheep. This is important when one may be delayed on the road with weak sheep, and when it would be disastrous to starve the animals for the necessary period when using the other drenches.

* In a radio address from 4QG.

**Better Rams.**

For many years the necessity for using better rams has been urged. The cost, we know, has been a deterrent these bad times, but judged from every point of view the producer is not getting the best out of his flock when using indifferent or poor sires. One imagines an owner putting a lb. of wool per head on his flock and gaining the consequent financial benefit as against the additional cost of his rams. Not only better rams, but rams suitable to the country, the rainfall (or lack of it), and the power to withstand hardships generally should be chosen. A type suitable for one district may prove a failure elsewhere. To the younger graziers a careful study of the choice of sires used by the older and successful graziers within their districts is advised. Advice on this important matter may be had on application to the Department of Agriculture and Stock.

**Culling.**

This operation, so necessary for the building up of a good flock, is, generally speaking, not sufficiently practised. Taken in conjunction with the use of better rams, no yearly practice on the property is of more importance. It should be the object of the grazier to fix a type suitable to his district and conditions generally. Of the utmost importance is the choice of this type. Among the ewe flocks everything should be rejected not coming up to this standard. Being not true to type, uneveness, malformation, over-strength in the fleece, ultra fineness possibly, want of size or constitution, all call for the rejection of such sheep as the future breeders.

No domestic animal known responds so quickly to careful selection and breeding as the sheep, and in no case do such quick profits result. In breeding remember too violent a contrast in mating throws the progeny all ways.

**Stock Licks.**

The use of a suitable lick in some districts, particularly during the winter months, or during periods of drought, is an absolute necessity, and I think graziers in districts where there is a mineral deficiency in the pastures would be well advised to supply their flocks with a lick, especially during winter.

The choice and use of a lick should be determined by proved mineral deficiencies in the pastures and water to which stock have access. The grazing areas of most of Australia are notoriously deficient in phosphates containing that important ingredient to body building—phosphoric acid ($P_2O_5$). Phosphates, then, should form the base in nearly every case of animal nutrition. Other ingredients should be added as the necessity dictates. For instance, salt is a necessity in most cases, but should the supply of water be saline, salt may be greatly reduced, or altogether eliminated.

A tonic action may be required; sulphate of iron prescribed in certain quantities will supply this. A laxative may be required (especially on very old winter feed or on scrub); Epsom salts will fill this necessity. For some time past it was thought that the use of iodine (potassium iodide) was necessary. This, however, has been disproved.

It will be seen how necessary it is to supply the particular want of wants, in some districts especially. During a hard winter the addition of a protein in the shape of a meal may be advantageous to the flock.

For the reasons given, graziers are advised to have the necessary materials on hand, with the object of mixing the lick as required, adding those ingredients required for the special purpose and leaving out others as circumstances dictate.

A note of warning may be sounded with regard to salt. There is a popular opinion that the animal is the best judge of how much salt to take. This may be right with regard to dry sheep, but in the case of ewes in lamb and half way through the period of gestation there is a distinct danger of supplying too great a quantity. For the ewes mentioned and at the period stated the supply of salt should be greatly reduced or altogether eliminated.

**Woolclassing.**

Too much stress cannot be laid on this important part of the business during the graziers' harvest.

While prices for wool have been so depressed, some owners have neglected to make the best of their clips in the matter of good and scientific classing. Any neglect in the get-up of the clip is false economy, especially when prices are down and the last shilling is called for.

There may be many indifferent classers, but the grazier would be well advised at all times to pay a good man for this important work. The wages may be regarded as an economy, and with a competent classer there should be a substantial surplus.

**Overstocking.**

The practice of overstocking cannot be too severely condemned. We know the temptation in a good season when grass is plentiful and money available, but, taken over a period of years, there is no doubt whatever that the owner who stocks well within the carrying capacity of his holding will come out well ahead of his neighbour owner who indulges in the practice of overstocking.

Too often overstocking results in the fact that sheep cannot be removed when necessary. Again, during a dry time the wool clip is deleteriously affected. Two well-fed sheep will be found more profitable than three half-fed animals, and generally the whole station management is simplified when sheep are maintained in good condition.

Parasites of all sorts are more likely to attack flocks on an overstocked property than one on which the sheep are adequately fed.

**The Blowfly Problem.**

Up to the present time the method found most effective is jetting. Where partial failures have been reported, we have reason to think that the operation has not been properly carried out. A plant to give the necessary pressure is essential, and the utmost care must be taken to see that the ingredient used gets right on to the skin. Judged from an economical point of view, good results have followed the use of arsenic 7 lb., washing soda 6 to 7 lb., and soft soap 1 lb. to the 100 gallons of water.

The pressure required varies with the quantity of wool, and one should vary it accordingly; from 100 lb. to the square inch up to 160 lb. to the square inch will be found sufficient. Satisfactory results have been achieved with the use of some of the better known powder dips, and there are on the market other preparations which are both economical and effective.

**Drought Fodder.**

There always appears to me that there is something wrong in the scheme of things when periodically we lose such vast numbers of sheep through the ravages of droughts. While all prices in the industry are so depressed and stock values are so low, it may not be the right time to mention this matter. However, we will take it from the point of view of moderate seasons and moderate prosperity.

I would like to propose what may be regarded as an insurance scheme against loss. During lush seasons both lucerne hay, well baled, and maize grain is relatively cheap, and provision could be made by graziers, during these good seasons, to put some capital annually into these commodities with the object of forming a fodder reserve for the inevitably recurring dry time. Neither well baled lucerne hay nor maize may be regarded as perishable, if properly stored.

The usual practice with owners in a position to do so is to buy when the drought is upon them. This means enormously enhanced prices for the fodders, and too often a real difficulty in getting supplies at all.

**Wise Expenditure—Over-improvement.**

My remarks under this heading are chiefly addressed to the young grazier and selector starting out to improve new country, or to establish a selection on old sheep areas. Much money, and borrowed money at that, has in the past been spent on unreproductive improvements. On the other hand, in some cases wise expenditure has not been undertaken to the eventual loss of the settler.

Every intended expenditure should be carefully thought out and every pound made to pull its weight. Water conservation where necessary should have a first call on capital. Fencing demands special thought. The cost of many a mile of fencing could have been saved if the advice of an experienced grazier had been sought previous to its erection. Ringbarking, where necessary, is almost always a judicious expenditure, but the areas to be operated upon should be carefully chosen. If an expenditure is worth while, the work resulting is worth doing well. Makeshifts never pay on a selection, and the continual cost of upkeep is always a drain.

To sum it up, the young grazier would be well advised, in a general way, to put the capital available into the improvements from which his income is to be derived.

## PIGS AT THE BRISBANE SHOW.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

MUCH enthusiasm was displayed at the Pig Pavilion at the Exhibition Grounds, Brisbane, during Show week, when a large and varied collection of stud pigs in several breeds were penned, together with an instructive and interesting display of porkers and baconers. As is usual at such gatherings, many interstate and numerous overseas visitors were present and enlivened the gatherings by useful and constructive argument, particularly the Irish visitor who assured everybody that there is no bacon on the British market that realises more than that marketed by Pat, Mick, and Co., whose knowledge of pig lore is world-wide and very well understood.

Included among interstate exhibitors was Mr. Ted Charlish, of the Norfolk Stud, Camden, New South Wales, who carried off championships in the Large White and Middle White senior boars, Middle White sow, and reserve champion in Large White sows, as well as numerous other prizes, including Large White breeder's group.

Mr. M. Moffatt, of Byron Stud, Billinudgel, New South Wales, again carried off premier award in the Tamworth Boar classes with that very much admired champion boar Byron Restart, who has a lengthy list of championships to its credit, and is still in good form, although showing heavy development of the forequarters—a characteristic that develops in strong masculine boars as they advance in age. Byron Restart 1767 is a very noted son of the imported Whittingham Restart purchased in England several years ago by the New South Wales Pig Expert, Mr. A. F. Gray. Mr. Moffat will, in all probability, be an exhibitor at the Sydney Royal in 1934, where he hopes to pen a representative display.

Messrs. I. M. Cash and Son, of Ferndale, Jindivick, Victoria, were also exhibitors at Brisbane. Although they were not fortunate enough to secure awards, they effected satisfactory clearances of their pigs at auction. St. John's College, Woodlawn, New South Wales, penned a large exhibit, their representative—the genial Father Monaghan—being a constant visitor to the section.

Mr. Len S. Ducat, who a few years ago had a very large entry, was once again included among the visiting exhibitors, and appeared to delight in renewing acquaintance with friends of former days.

Thirty-four exhibitors penned pigs at this year's show—quite an array in comparison with the mere handful of ten or twelve years ago.

Visiting judges included Mr. A. F. Gray, New South Wales Pig Expert, who adjudicated in Tamworths, Poland-Chinas, Wessex Saddlebacks, and Large Blacks. Mr. G. A. Bedwell, who judged Berkshires, Large and Middle White breeds. Mr. C. H. Shelton, of the Queensland Co-operative Bacon Association Factory at Murarrie, judged the commercial classes. Mr. J. P. Bottomley, the genial chairman of the Royal National Association Council, is officially recognised as steward-in-chief of the Pig Section. Mr. George White was the officer in charge of the Pig Pavilion, Mr. Chas. Lee being the honorary council steward.

*Berkshires.*—Imported blood secured premier honours in this breed, Mr. Mat. Porter's Grafton Trump, sired by Ridgemoor Pygmalion 5th 1012 (imp.), being champion boar. This immense animal, a son of the imported sow Highbury Lady 2nd 9954, was born at the Grafton Experiment Farm, New South Wales, and has already secured champion awards at several other Queensland shows.

The Victorian-bred sire Caraalulup Harry 10020 owned by the veteran Mr. H. Franke, of Cawdor, won reserve champion, while a son of this fine animal in Cawdor Happy Lad 11603, owned by Mr. O. L. Klein, of Ma Ma Creek, was placed third. These pigs created considerable interest, particularly as at last year's show the champion boar was unplaced, apparently being considered as carrying too much of the "English" and not enough of the "Australian" type for the judge on that occasion.

Goodna Mental Hospital, whose representative, Mr. Tom Price, was again to the fore, did not secure a place in the senior boar classes, but carried off the coveted blue with Goodna Master in the under 21 months boar class, in which Gatton College secured second award with Gatton Premier.

Three very choice Berkshire sows and litters were penned, again emphasising the productive powers of this breed. Here the reserve champion sow, Cawdor Venus, was placed first, with the exhibits of Gatton College and Mr. J. W. Handley occupying second and third places.

The champion sow was Mr. Mat. Porter's Roselock Tessie 11355, who had not, at time of judging, produced the litter expected of her to have her included in the sow and litter class. This occurrence emphasises the wisdom of allowing for due transfer of a sow from a "dry sow" class to that of a "sow and litter," and vice versa, if occasion requires.

One cannot pass from the Berkshire classes without remarking on the evenness of entries and the lack of inferior sorts. The judge did not please everybody, but was honest in his decision to keep to the type he considers most suited to trade demands. Needless to add, there were many excellent "runners-up," particularly in the classes for mature stock, the prize list being all too short for the numerous entries penned.

Mr. H. Franke won the prize in the Berkshire boar and progeny class, also in breeder's group, in which there was very keen competition.

*Large Whites.*—Although the number of exhibitors was limited, the entries were large and comprehensive, competition being strengthened by the team penned by Mr. E. Charlish, of the Norfolk Stud, Camden, New South Wales, who accounted for several important awards, his Norfolk King John 1st 2016 being champion boar and topping the stud sales at 20 guineas, this fine animal now being the property of Mr. H. B. Kerner, of Warwick road, Ipswich, a prominent exhibitor at many Southern Queensland shows. That very fine animal—the son of the Sydney Show champion, Wall King David 14th (imp.)—known as Norfolk King David 5th, owned by Gatton College, Queensland, was placed reserve, but is quite as good, and being "proved" is that much better as a stud sire. These two boars will doubtless fight it out at numerous shows here in future, and they will be a centre of interest wherever penned.

In Large White sows and litters, the Kingston Pig Farm Company's Kingston Poppy secured the premier award over the College sow Jerseyholm Canadian Patricia; both sows were rearing vigorous families of splendid type.

The champion sow was Pine Terrace Iris (imp.), a New Zealand-bred sow shown by the Kingston Pig Farm Company.

*Middle Whites.*—Three years ago there was one Middle White pig penned at Brisbane. This year the number increased to forty—a very fair exhibit in a State where, as yet, the Middle White is not well known. Together with the Large White, they are included as the special breeds under Queensland's Better Board Subsidy Scheme; so that with an increase in the trade in frozen pork, and the general tendency to improve breeding stock to provide for expansion of overseas trade, the future of these two breeds seems assured. The veteran Sydney champion, Norfolk Nobleman 3993, secured the premier award, and with other purebred sires and dams with championship honours annexed the special ribbons provided by the Australian Stud Pig Breeders' Society. A son of the champion, shown by Mr. J. J. Slack, secured reserve champion, and will no doubt in due course reach the top of the pole. Competition in this breed was confined to the exhibits of Messrs. E. Charlish, I. M. Cash and Sons, and Mr. J. J. Slack, of the City Cash Butchery, Ipswich, Queensland. The champion sow was Norfolk Favourite 2nd, owned by Mr. Charlish; she is a daughter of the imported Pendley Deliverance 2nd 4190, a great and productive sire. The classes in this breed were somewhat limited, but with increased entries, better prize money, and more opportunity, greater competition may be looked for.

*Tamworths.*—Mr. A. F. Gray, of New South Wales, had a severe test of strength and endurance in the long and difficult day experienced in judging the several breeds that came under his control. In Tamworths, quality was paramount, and at no previous show were there so many attractive and well-set-up animals.

Mr. M. Moffat, of Billinudgel, New South Wales, secured the premier award, being closely followed by a very choice quality sire in Wattledale Bill, shown by Mr. J. Barkle, an animal a judge might readily have placed ahead of the senior boar. Mr. Barkle had a very fine team and secured the prize for boar and progeny, breeder's group, and a comprehensive list of awards in other classes. As in Middle Whites, competition was restricted, but the studs represented were of the very best and included also Messrs. P. J. and D. F. L. Skerman, of Kaimkillenbun, G. H. Woodall and Sons, of Kingaroy, Mr. W. S. Hendry, of Clifton, St. John's College, Woodlawn, New South Wales, and Wide Bay Stud Piggery, for whom Mr. R. Williams was Messrs. Drummond and Parke's representative. Mr. E. L. Melville was also an exhibitor.

Mr. W. S. Hendry's Byron Challenger, champion boar at Toowoomba Show, again secured a proud win in a class in which Wide Bay Stud Piggery secured the red ribbon. In sows Mr. J. Barkle secured both the championship and reserve championship awards with stock fit to win in any show in the world. The sows

and litters were very choice, Mr. G. W. Winch penning his Traveston Viola for the first time. Mr. G. E. C. Stephen, of Toll Bar road, secured a prize or two and had a big team forward, while Mr. H. B. Kerner, of Ipswich, penned the Victorian-bred sow Warringal Precocious, and secured a coveted blue. This sow is a daughter of the imported Berkswell Constance, and has a great future before her. Mr. Barkle finally annexed the silver cup presented by the National Pig Breeders' Association of England and which, to fulfil stipulated conditions, had to be won on three separate occasions with different animals.

*Poland Chinas.*—This breed was represented by four exhibitors only, the total entry being a dozen head; the difficulty of securing unrelated blood and the uncertainty of the position in regard to the breed's future counting against extension of competition.

Mr. F. E. Grimsey penned the champion boar, Flagstone Lad, bred by Mr. W. H. Sauer, of Miva, Mr. Sellars' Allambies Roger being the runner-up, the latter's Flagstone Dulcie being champion sow, both boar and sow being the progeny of that very fine old sow, Broxburn Select.

*Wessex Saddlebacks.*—Better entries and increased interest emphasised extension of competition in the white-collared breed, in which Mr. R. Turpin and his co-workers (his sons) and Mr. C. F. Marshall and Mr. A. Mahaffey were prominent exhibitors. The champion boar was bred by Mr. Turpin and shown by Mr. and Mrs. A. Alford, of Traveston, who in former days in the ''Old Land'' bred and handled this breed to advantage.

Both imported animals secured prominent awards, the more recently imported sow, Maiden Beech Ringousel, being placed second to the earlier importation, Holmsleigh Ace.

*Large Blacks.*—Mr. D. R. Law was the sole exhibitor, his entry totalling half a dozen head in two classes. Somehow or other the Large Black does not make progress in the North, and their future is very doubtful.

*Porker Pig-raising Competition.*—A feature at the Brisbane Exhibition was a new competition styled as above, designed to afford pig breeders opportunity of demonstrating their ability to produce large, fast-growing litters of pigs which meet the requirements of the pork trade. Judging was on a basis of suitability of the pigs for the pork trade, and litter weight for age, and although shorn of much of its earlier importance was productive of excellent results. Five entries (in all about fifty pigs) were penned, and results favoured Mr. J. J. Slack, represented by Mr. T. M. Wallace, with Mr. P. V. Campbell second, the first prize pen being Middle White Tamworth cross, the second prize lot being of Chester White origin.

Kingston Pig Farm Company, Gatton College, and Wide Bay Stud Piggery were the winners in the local bacon, while in export baconers Kingston Pig Farm Company was placed 1st, Wide Bay Stud Piggery 2nd, and Gatton College 3rd.

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## TUBERCULOSIS IN PIGS,

By J. A. RUDD, L.V. Sc., Department of Agriculture and Stock, Brisbane.

IT is essential that, to keep pigs healthy and free from infection, they should not be allowed or brought into contact with stock affected with tuberculosis or other disease. Young animals, particularly pigs, are more susceptible to disease than those which are mature. The majority of pigs condemned at bacon factories and abattoirs are young pigs under twelve months of age, and a large percentage of these pigs are under six months old.

It is apparent that these animals must have picked up infection either from consuming infected food—i.e., cow's milk saturated with tuberculosis, or from diseased meat, offal, and blood from infected animals which have either died or been destroyed on the farm. When advised by the management of abattoirs, meat-works, or bacon factories that pigs have been condemned for disease, an effort should at once be made to concentrate on all possible sources of infection. All cows infected with mammitis should be immediately isolated and vaccinated for mammitis with gradually increasing doses of vaccine. The vaccine and directions for use could be obtained at the Animal Health Station, Yeerongpilly, Queensland. All cows which do not respond to treatment under direction (i.e., about 2 per cent. of all herds have tuberculosis of the udder) should be destroyed. There are, however, other sources of infection, and these should be carefull examined, such as surround-

ings and troughs. All troughs which are so old as to be worthless should be discarded and their places taken by fresh wooden or other troughs. Fowls are a constant source of infection, as they carry avian tuberculosis and infect pigs. Fowls should not be allowed to roam at large among pig-sties or in the stables. Fowls are particularly dangerous if the dairy herd is infected with tuberculosis, as they become infected and in turn infect the pigs.

The application of the tuberculin test to the dairy herd should be considered in relation to the general process of cleaning up, but this does not affect the result if fowls are allowed access to the sties and paddocks in which pigs of all sizes and ages are kept, as they will continue to infect the pigs. A large percentage of head and throat infections are due to avian tuberculosis.

As the life of the pig is short and his commercial value proportionately small, any check from disease is a grave disadvantage and makes the keeping of pigs the reverse of a commercial proposition. Prevention is by far the best, and all avenues should be explored in order to make certain that healthy stock alone are kept, and all likely sources of infection so guarded that the possibility of wastage from disease is practically wiped out by taking such measures as will ensure that only healthy pigs are bred and kept on the farm.

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## OCTOBER PIG SCHOOL.

ARRANGEMENTS have now been completed for holding the annual school of instruction for those interested in the breeding, feeding, and marketing of pigs. The school is to be held at Gatton College, commencing on 2nd October, and concluding on 13th October. Applications are now being received, and those who are able to arrange attendance should lose no time in lodging their applications with the Principal, Queensland Agricultural High School and College.

Concession fares by rail are available throughout Queensland, and the school fees (approximately £3 10s.) include all charges for board residence, instruction, and excursion to bacon factory. The Principal, Professor J. K. Murray, is anxious to have all applications as early as convenient, in order to arrange accommodation; hence those interested will materially assist by prompt attention in order to save disappointment.

Professor Murray advises that there need be no fear on the part of farmers with regard to attendance at the school by members of their families, provision having been made for accommodation, meals, recreation, and instruction, and those attending can be assured that their personal wants will not be overlooked. The social side of the school is a special feature. Every evening, before the lecture session begins, opportunity is afforded for a free and easy hour, during which questions relative to any phase of agriculture may be asked. At these sessions officers attend who are associated with other branches of College life, such as the Instructor in Animal Husbandry, the Plant Breeder, and the Horticulturist. In fact, question time is one of the most valuable periods of the day for those engaged in dairying, fruitgrowing, or in general agriculture.

The evening cinematograph and lantern lectures are of great interest and are much appreciated. As opportunity offers, other authorities on agriculture attend to address school members; there are illustrated lectures on tuberculosis in cattle and pigs; poisonous weeds and plants; farm bookkeeping; also outdoor talks on various types of agricultural and dairy machinery. Visits to the school by representatives of the Queensland Branch of the Australian Stud Pig Breeders' Society, the Queensland Pig Industry Council, and the Royal National Association are also appreciated.

At the College piggery more than 200 pigs are kept. These comprise representatives of several breeds for stud purposes, as well as the production of pork and bacon. Results of a series of experiments in the feeding of pigs will be available. A special item in the programme is a visit to the metropolitan bacon factories, where various operations associated with the manufacture of bacon and ham are seen in full swing. This year it is proposed to arrange a visit to the Brisbane Abattoir. In addition, a visit wil be paid to the milk and cream testing floor, the Agricultural Chemist's laboratories, and the Entomological Museum at the Department of Agriculture and Stock. Further particulars and railway concession forms may be obtained from the Principal at the College, or inquiries may be made at the Department of Agriculture and Stock, Brisbane.

## CRUELTY TO TRAVELLING STOCK.

*Taken from the last annual report of the Queensland Society for the Prevention of Cruelty:—*

THE cruelty associated with the transport of stock by rail is a matter about which this society has been much concerned. It is recognised that a certain amount of rough usage is inseparable from cattle conveyance by rail, but there are certain preventive measures that, if observed, would minimise the cruelty and loss associated with railway transport of stock. Those measures are: Care in trucking, not to over-crowd, so that if a beast gets down it can get up or be put on its legs again. Then comes careful driving of cattle trains, avoiding sudden stopping or fast travelling on sharp bends, and then when an animal gets down steps should be taken to get it on its feet before it is trampled to death. Here is an extract from the "Courier" of the 6th June, 1933:—

### Stock in Truck—Some Trampled to Death—Overcrowding Alleged.

"The danger of loss through overcrowding of cattle trucks is emphasised by a report from a Yeulba correspondent, who states that on Tuesday last a gang of fettlers at Yeulba took six hours to clear a truck in which four fat bullocks, of a consignment of twenty-one, had been trampled to death. Two other animals were so badly maimed that they had to be destroyed, and the rest suffered from broken horns and bruised bodies and heads. The bullocks, the correspondent states, were loaded into a K wagon at Roma, and were consigned to the saleyards at Cannon Hill, Brisbane. On the arrival of the train at 3 a.m. on Tuesday the railway officials refused to allow the truck to go forward, and a gang of fettlers was summoned to unload the cattle and release them from their sufferings."

Apart from the cruelty involved the economic loss must be considerable in the course of a year. In the first 30 miles of the journey referred to in that paragraph the loss sustained is about £60, and it must be remembered that there are more cattle transported by rail in Queensland than in any other State in the Commonwealth.

The time stock trains take to cover a journey is unusually long in Queensland. Here are the times of passenger and stock trains over the same journey—

| | Miles. | Mail train. Hours. | Stock train. Hours. |
|---|---|---|---|
| Charleville to Roma Street | 483 | 21¾ | 33½ |
| Roma to Roma Street | 318 | 13½ | 21¾ |
| Longreach to Roma Street | 823 | 39½ | 54 |

and compared with New South Wales our stock trains are on the slow side; for instance, a stock train from Bourke to Sydney takes 29½ hours to cover 521 miles, while a stock train from Charleville to Brisbane, 483 miles, takes 33½ hours.

It therefore is obvious that something could be done to shorten the time of stock trains over such routes.

As to other remedies, it may be mentioned here that of recent years in New South Wales an inspector from the Society for the Prevention of Cruelty is continually travelling on stock trains and reports on any irregularity or carelessness on the part of the train crew or the men who are travelling in charge of the stock. It is alleged that formerly the drovers on reaching stopping places were more concerned about seeking refreshment than about seeing to stock that might be down, &c. But now they are alert and see about getting any down animals on their legs again. It is claimed that the result of having the inspector on the trains is that in two years the losses in stock have been reduced by about 6 per cent. We understand that the stock-owners' association assists the society to the extent of the inspector's salary.

Another form of cruelty associated with the transport of stock by rail is that of trucking sheep which are heavy with lamb. The rush and struggle of trucking and the effect of the railway travelling is that the unborn lamb becomes displaced. While there is some excuse for trucking sheep in this condition from a drought-stricken area in an effort to save them, there is no excuse for trucking them to market, and recently we have had the peculiar experience of seeing some of these sheep dropping their lambs in the yards while they are being sold to the butchers for slaughtering purposes. On inquiry we were informed that this is prohibited by the Stock Department of other States, and in all seriousness we would ask our Queensland Stock Department to consider if this sort of thing should be allowed to continue.

**Overcrowding of Poultry.**

From the same report:—

There were ninety-five cases of overcrowding poultry in crates or jamming fowls in low crates in which the birds could not stand up. In some of these crates the top is of wire-netting, through which the birds put their heads; then, when other crates are tossed on top of them, either in a railway truck or when being carted from the railway to the poultry dealers' places in Brisbane, in many instances the birds get their heads almost torn off. We have progressed some distance in getting poultry raisers and dealers to improve the conditions under which they transport and handle the birds; but there still are cases coming under notice where, through callous indifference, brutal cruelty is inflicted. This is a Prevention of Cruelty Society, but when people ignore our warnings and repeat acts of cruelty, then they will have to answer to the Courts. The offender will find this expensive in time, money, and reputation. We have had several such prosecutions, and to avoid this all we ask poultry raisers to do is to transport their fowls in crates that are higher than the birds. and give 1¼ cubic feet space for such birds as fowls and ducks, and a correspondingly increased space for larger birds; have a closely-boarded top and bottom to the crate, so the birds' heads and legs do not get through and get mangled, and wire-netting sides for ventilation; and provide food and water, especially for long journeys.

This is a matter about which we have had many protesting letters from producers and progress associations complaining that the space required is too great, and the conditions should not apply to birds that travel only a short distance to the city and are only a few hours in the crates. Our answer is that the space required for the various classes of birds is that fixed by the poultry experts of the State Agricultural Department. With regard to the time the birds are in the crates, we are aware that they are usually crated after going to roost in the evening and despatched to market next morning. They are sold usually between 10 a.m. and 1 p.m., are mostly taken delivery of in the afternoon, and in most instances are kept crated until required for the table. Thus it will be seen that thousands of birds coming into the city each week-end, that are crated on Thursday, sold on Friday or Saturday, are kept crated until the cook starts to prepare them for Sunday's dinner. In such circumstances we say we are not unreasonable in requiring that those birds should have room to stand up and have food and water provided. We should not like to hamper the poultry or any other industry, and our experience has been that poultry raisers have suffered their greatest loss by the death of the birds through overcrowding in crates, especially in hot weather.

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**TO SUBSCRIBERS—IMPORTANT.**

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

# LEGISLATION REGULATING THE SALE OF SEEDS FOR PLANTING OR SOWING.

By F. F. COLEMAN, Officer in Charge, Seeds, Stock Foods, and Fertilizers Investigation Branch.

## Definition of Vendor.

A vendor under the Pure Seeds Acts is any person who sells or offers or exposes for sale or contracts or agrees to sell or deliver any seeds.

## Invoice to be Given by Vendor.

The Acts require that on the sale of any such seed of not less than 1s. in value, the vendor shall at the time of the sale give to the buyer, or, if the buyer is not present at the time of sale, forward to him an invoice containing the statements required by the Acts.

The wording of the invoice should be to the following effect:—

> "The seeds mentioned in this invoice are for planting or sowing. Such seeds are of the kind or kinds specified, and contain no greater proportion or amount of foreign ingredients than is prescribed with respect to such seeds."

## Seeds Sold in Made-up Packets to have Year of Growing Marked.

In the case of seeds in pictorial or other made-up packets, the year in which such seeds were grown must be clearly and indelibly marked upon the outside of each packet.

## Definition of Foreign Ingredients.

"Foreign ingredients" shall include inert matter, seeds of weeds, and seeds of any kind other than the seeds in question; or dead, diseased, insect infested, non-germinable, or hard seeds.

"Inert matter"—Broken seeds less in size than one-half of a complete seed; or chaff, dust, stones, or any material other than seeds.

"Hard seeds"—Any seeds whose seed coats are so impervious to water as to delay germination.

## Prohibited Seeds.

The following seeds are totally prohibited:—Seeds of *Cuscuta* spp. (Dodder), *Datura spp.* (Thorn Apple), *Ricinus communis* (Castor Oil plant), and diseased or insect infested seeds.

## Quantity of Foreign Ingredients Allowed.

The quantity of foreign ingredients allowed in the various kinds of seeds is set out in the Regulations, a copy of which can be obtained on application to the Department of Agriculture, Brisbane.

## Efficient Seed-cleaning Machinery.

The Regulations do not apply to—

Seeds sold by the actual grower direct to any vendor in possession of one or more efficient cleaning machines, for the purpose of the seeds being cleaned and graded before being offered for sale as seed for sowing.

## Samples from Bulk in Sender's Possession.

The Regulations provide for the examination of samples at the Seed Laboratory, Brisbane, the cost being the nominal one of 2s. 6d. for each Certificate of Analysis. When sending such samples, it is of the utmost importance that they be drawn by the sender from seeds in his actual possession, care being taken to make them truly representative of the bulk.

To enable this to be done satisfactorily they should be drawn alternatively from the top, middle, and bottom of the bags, the proportion of bags to be sampled being as follows:—

1 to 20 bag lots—Sample should be drawn from not less than every bag.
21 to 40 bag lots—Sample should be drawn from not less than 21 bags.
41 to 60 bag lots—Sample should be drawn from not less than 28 bags.
61 to 80 bag lots—Sample should be drawn from not less than 32 bags.
81 to 100 bag lots—Sample should be drawn from not less than 36 bags.
100 to 200 bag lots—Sample should be drawn from not less than 40 bags.
200 bags and over—Sample should be drawn from not less than 20 per cent.

If, when drawing samples, it is observed that great variation occurs in the bulk, two or more samples should be obtained, each representing bags whose contents are similar.

After the sample has been drawn as above indicated it should be emptied out on to a large piece of paper, thoroughly mixed, and then a quantity not less than the prescribed weight for such samples should be drawn for purposes of forwarding to the Seed Laboratory. A duplicate sample should be kept for reference.

In the Seed Laboratory, great pains are taken to ensure absolute accuracy of work. It, therefore, follows that all this care is wasted unless the person forwarding samples for examination takes some trouble to ensure that the samples drawn truly represent the bulks they are obtained from. The minimum weight of each sample and marking should be as hereunder set out:—

### Weight of Samples.

PRESCRIBED WEIGHT OF SAMPLES.

| Kind of Seed. | Weight Required. |
|---|---|
| Barley, Beans, Cowpeas, Maize, Oats, Peas, Rice, Rye, Tares, Wheat .. | 8 oz. |
| Canary, French Millet, Japanese Millet, Linseed, Lucerne, Prairie Grass, *Setaria Italica* (Foxtail Millet), *Sorghum Sudanense* (Sudan Grass), Sorghum, White Panicum | 4 oz. |
| *Paspalum dilatatum*, Rhodes (*Chloris gayana*), Rye Grass, *Phalaris tuberosa*, Cocksfoot, Couch, etc. | 2 oz. |
| Beet, Cabbage, Carrot, Onion, Parsnip, Radish, Tomato, Turnip, and Vegetable Seeds of like size | ½ oz. |
| Vegetable Seeds in Made-up Packets .. .. .. .. .. | 5 packets. |
| Agricultural and Vegetable Seeds other than those indicated above .. | 2 oz. |

In the case of seeds containing weed seeds or other foreign ingredients, double the weight above mentioned should be sent.

### Marking of Samples

All samples must be plainly written on in ink, setting out the undermentioned particulars:—

(1) Name under which the seed was purchased, or is proposed to be sold;
(2) The number of bags from which the sample was drawn, and the number of bags in the whole consignment;
(3) The marks of identification, if any, on such bags;
(4) The name and address of the sender, with date of sampling;
(5) If the sender is not the actual grower, the name and address of the sender's supplier, with date of delivery.

Samples should be addressed as follows:—

Seed Sample for Examination.
Officer in Charge,
Seed Laboratory,
Department of Agriculture,
William Street,
Brisbane.

The sender's name and address and the particulars as before set out must be written in ink on the actual container.

Special care should be taken to securely fasten up the sample. The examination of samples received at the Laboratory that have been opened in transit is useless for any determination, as only a sample received intact can be taken as representing any bulk.

### Fee of 2s. 6d.

A covering letter, enclosing the prescribed fee of 2s. 6d. per sample, should be addressed to the Under Secretary, Department of Agriculture, Brisbane.

**Free Examination.**

It cannot be too widely known that the Seed Laboratory at Brisbane examines, free of charge, all samples representing seeds that farmers have purchased for their own sowing.

**Complaints.**

In case of any complaint regarding purity or germination the buyer should at once send a sample of the seed, marked with the particulars as above set out, together with a covering letter to the Department advising of the despatch of the sample, which will be examined free of charge.

**Certificates.**

Unless the sender is careful to forward a truly representative sample, the certificate is valueless. Under no circumstances is it a guarantee by the Department of Agriculture as to the bulk, but a statement as to the condition of the sample at the time when such sample was examined.

**Examine Goods on the Day of Delivery.**

Both buyers and sellers are urged to examine all goods on the day of delivery, and when in doubt regarding any seeds, fertilizers, pest destroyers, or stock foods, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be at once investigated.

## IMPROVEMENT OF CITRUS STANDARDS.

The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) stated recently that he had received a report from Mr. H. Barnes, Acting Director of Fruit Culture, who represented Queensland on the Commonwealth Citrus Committee which met in Sydney during the week.

The committee had discussed matters relating to inferior fruit and action necessary to improve the standard of production, the application of available knowledge held by the various States to the problems of production generally, organised marketing, and the position of the mandarin-growers, who were faced with a large production of fruit which was not saleable at payable prices.

Considerable good was likely to occur as a result of the deliberations of the committee, added Mr. Bulcock. It had been resolved that scientific research in various directions should be proceeded with without delay, and that a more wieldy committee than that which met in Sydney should be appointed from the Council for Scientific and Industrial Research and the Departments of Agriculture in the various States to set out in detail a programme to be expeditiously carried out. It was proposed that this body should absorb the present Citrus Preservation Committee, and that it should devote its attention to problems such as orchard factors, including suitable varieties, soil types, orchard management, maturity, handling and transport, and various problems relating to packing. The activities of the body would also include storage problems and overseas transport.

It was also resolved that sub-committees should be formed in each State representative of the local Department of Agriculture and the industry to work in conjunction with the head body for the purpose of investigating the problems peculiar to each individual State.

The Commerce Department, working in close association with the respective State sub-committees, was asked to undertake an investigation of the problems associated with the marketing aspect, and the Federal Citrus Council, in conjunction with the Commerce Department and the scientific committee previously mentioned, was asked to take up the question of shipping facilities at present available for overseas transport, and endeavour to obtain a more efficient service.

Considerable discussion had centred round a suggestion that the Commonwealth and State Governments should advance sufficient money to pay compensation for the destruction of 25 per cent. of the mandarin orchards in the Commonwealth. It was not possible to arrive at any finality on this matter, the representatives of the various State Governments being of the opinion that their respective Governments would not be in a position to accede to this request. It was finally decided that the mandarin industry in particular should be further investigated in each State, and that recommendations be made at a later meeting of the committee.

# AGRICULTURAL NOTES.

By H. S. HUNTER, Agricultural Branch.

## CROP PROSPECTS.

PROSPECTS for the coming season were greatly improved by the early August rains. An early spring is now pretty well assured, and early-planted crops are making good progress.

All agricultural districts from Mackay southwards are in particularly good order, and farmers have been encouraged to prepare large areas for early cropping. Attention is being given mostly to the planting of maize and potatoes. In some districts where plantings were made some weeks ago, the crops are above ground and making satisfactory growth, considering the cold weather. On the South Coast, where potatoes, in accordance with the usual custom, have been planted earlier than is possible in the districts subject to heavy frosts further inland, the combination of wet weather and frost has caused the tubers to rot, and consequently many growers in this area have had to replant. As the potato-grower must, of necessity, purchase seed imported from Southern States for the spring planting, a double planting is a somewhat expensive procedure.

The August rain was welcomed on the Darling Downs, where, perhaps, it was most needed. Although this winter has witnessed rainfall periods with unusual frequency, in practically every instance the precipitations recorded in the main wheat belt have been light, lighter than those received further west on the wheat-lands of the Maranoa—and in the aggregate not sufficient to ensure a thorough saturation of the heavier basaltic soils of the Downs country. The young crops of wheat and barley, however, are away to a good start, and with a continuance of favourable seasonal conditions, the area planted would be sufficient to ensure a heavy crop. The main wheat planting was somewhat late this season, but where conditions permitted of sowing earlier the latter crops are being grazed by stock. In addition to the winter cereals, an appreciable area on the Darling Downs has been prepared for sowing with maize and Sudan grass.

### Maize.

It is expected that there will be heavy plantings of early maize this year, as conditions are such as to guarantee the crops a good start. Although early-planted maize very often fails to produce grain, owing to the uncertainty of rain falling at the critical tasselling period, the crop is popular in the dairying districts, as it can be utilised for feeding to stock, or for conversion into silage, for which purpose it is unsurpassed.

If the experiences of previous season are any criterion, maize will be planted extensively on the Darling Downs this season, as this invariably happens after a light wheat crop.

### Canary Seed.

The period during which wheat and barley can be planted with safety is now practically at an end, but the sowing of canary seed can still be proceeded with. This is a valuable sideline crop for the wheatgrower, particularly the farmer who combines whatgrowing with dairying. It provides a good fodder, but the crop's real value as a revenue producer lies in the Australian market for canary seed, which is protected to the extent of a duty of £16 16s. per ton on imported canary seed.

Efforts have been made in previous seasons to secure a reduction in the duty, on the score that Queensland supplies were smaller than requirements. If the industry is to be retained for Queensland, the local growers must ensure that the Commonwealth requirements are catered for, and that the seed produced is as free as possible from impurities and seed broken by the harvesting machinery.

The championship winner in the White Spring wheat class at the Regina World Grain Show, Mr. J. W. Eade, of Euchareena, New South Wales, also has to his credit a championship at Chicago, with "Gullen," a wheat of his own breeding from a cross of some of Farrer's types. The variety with which he won at Regina this year also is of his own breeding. It is named "Boomey," and has been evolved from "Cedar" and "Gullen."

### Peanuts.

With a better season in view, peanut-growers are making arrangements whereby the present shortage of stocks will be remedied with the harvesting of the coming season's crop. Adverse seasonal conditions last year resulted in a short crop, which

enabled the surplus carried over from previous years to be disposed of, thus removing a problem which had caused some concern to the local industry. However, last season's harvest, plus the carry-over, was not sufficient to satisfy requirements, but the position has been met by the permission granted the board by the Federal authorities to import 350 tons of nuts of the Red Spanish variety, to be used for manufacturing purposes only.

The improved demand for the small Red Spanish nut creates a position quite different from that obtaining about five years ago, when this was the principal variety grown, but could not find an adequate market, except at oil values, owing to the preference for the larger Virginia Bunch variety. With limited supplies of Virginia Bunch seeds the Peanut Board at that time found itself in a dilemma, and unsuccessfully sought permission to import a large quantity of the seed. However, seed stocks gradually were built up, and the larger variety thereafter was produced in greater quantities.

The large attractive Virginia Bunch secures the cream of the trade—the nut-in-shell trade—but, whereas stained and discoloured shells until recently went to the manufacturers, they now find a ready market in a newly-developed shelled nut trade. Some authorities declare that the Red Spanish, although of unattractive size, really are of better quality than the larger-sized nuts.

Australia consumes annually between 3,000 and 4,000 tons of peanuts.

### Clydesdales in Demand.

A recent survey of the forms of tractive power employed on wheat farms in Queensland reveals that 12,223 tractors and 16,764 horses are employed in this industry. Both tractor and horses are used by 753 wheatgrowers, and 1,300 farmers rely on horses only.

In the mixed farming districts, reliance is placed on draught horses to a greater extent than is the case in the wheat and sugar areas. Within the past decade there has been a noticeable tendency throughout the agricultural countries of the world for horses to come back into favour to some extent. This tendency has been accentuated in recent years by the low values of primary products, until at present there is an acute shortage of good breeding stock in the Commonwealth. A lucrative market here is attracting stallions and mares from New Zealand, and local breeders are reaping the reward of their foresight.

On 1st August an old custom was revived in Sydney in the form of a spring sale of stud Clydesdales, when 17 lots realised 2,250 guineas, or an average of 132 guineas per head. The top price at this sale was 230 guineas for a three-year-old New Zealand-bred stallion, but a bid of 480 guineas was refused for the stallion Confidence. At a similar sale held in Melbourne, where 140 stallions and mares were offered for sale, the top price was 470 guineas, and 60 stallions averaged 200 guineas. At the Brisbane Show sales 325 guineas was paid for one entire, and every animal showing quality realised more than 100 guineas. As most farmers are aware the ruling values of working horses are proportionately high. It has been advocated by the Department in the course of the past four years that farmers might well consider raising their own replacements of draught stock by breeding from, say, a couple of good mares each season.

### Better Butter Marketing.

One difficulty with which the Australian dairying industry has to contend is the prejudice existing in Great Britain in favour of Danish butter, resulting in a lower price for Australian and its exclusion from the northern parts of the United Kingdom. Persons competent to express an opinion are unanimous on the point that this is largely due to the fact that Australian butter is practically unknown as such to the individual consumer.

The Federal Government and the dairy industry authorities are taking action to overcome this disability, but results will be a matter of time and will involve considerable expenditure in advertising. The butter export industry is of major importance to Queensland, and, incidentally, to every resident of this State. It may not be generally known that any Queenslander can assist in this effort of bringing to the notice of British consumers the high quality of our product by forwarding, through the Butter Board, small parcels of butter to relatives and friends in the old country.

### Cold Weather affects Fruit Sales.

Continued cold weather during August had an adverse effect on the demand for fruit and on the quality of some lines. Pineapples, particularly, are suffering from the prevalence of "black heart," which involves sorting and an amount of

wastage. The canneries are relieving the fresh fruit market considerably, and in this way the position will be eased until the demand improves with warmer weather. Papaws are coming forward freely, but the demand is slow. Brookfield papaws, on account of their superior flavour, are realising top prices.

Strawberry supplies are in excess of those of past years, and considering the wet weather the quality generally is good. Although the jam factories are operating, prices are such as to leave little profit for the grower.

### Surplus Citrus Production.

Growers of citrus fruits have received the welcome news that the New Zealand Government is prepared to permit the entry into New Zealand of oranges produced in South Australia. Although not what was hoped for, it will provide welcome relief to the local market. The New Zealand embargo has forced Australia to seek other oversea markets for surplus oranges, and the work done in this direction should be of much value during the next few years, when surplus production is expected to be increased considerably by new groves coming into bearing. Exports to oversea countries, other than New Zealand, have been encouraged by the Federal Government's guarantee of 13s. per case. Stringent export regulations have been issued which ensure that only good quality, attractively packed, and graded fruit will be exported.

The citrus-growing industries of the various States have recognised, through the Federal Citrus Council, that they must put their respective houses in order. At their request, the Federal Government has appointed an investigation committee, which, amongst other matters, will inquire into the production of inferior quality fruit.

### Queensland Oranges and Apples.

The fruit section at the Brisbane Show was notable for the wide range of fruits displayed, and for the keen competition among the exhibitors. Southern visitors have expressed the opinion that Queensland is better adapted for the production of high-quality citrus fruits than the Southern States. In the apple classes Stanthorpe exhibits, though cold-stored for some months, triumphed over exhibits from Tasmania.

The main business of the committee appointed to investigate the citrus industry will be the collection of statistical information showing area and production of different varieties, with the estimated proportion of inferior fruit; also research work on the various problems associated with soils and stocks. In an endeavour to ease the Australian market a further shipment of oranges left for England in the course of the month, when 12,000 cases were placed aboard the "Chitral" at Sydney.

### Success of the Brisbane Exhibition.

This year's Royal National Exhibition has exceeded all expectations, and could have been regarded as a remarkably good effort had it been preceded by a favourable season. The most outstanding feature, however, is the spirit of optimism and faith in the rural industries pervading the ranks of the country exhibitors and which has continued undimmed after over three years of depressed prices for agricultural products. The dairy cattle section, as usual, was notable for the quality and quantity of the entries. The pig section, which had expanded considerably, created more interest than usual, chiefly owing to the preparations now being made to embark upon a larger export trade, and as white-skinned pigs are favoured for this trade the classes set apart for these animals were watched keenly by pig-raisers. A feature of the section was the display of six typical sides of bacon, specially obtained from overseas countries which supply to the English market. Meritorious performances in this section were those of Mr. J. Barkle, of Kingaroy, who becomes the owner of the Tamworth cup, after winning it three times, and the Kingston Pig Farm Company, which won first and second prizes in the class for pen of three baconer pigs for the fourth occasion. On one other occasion this company secured first and third in this class.

In the farm produce section there were over 600 entries, the strongest part of which was that devoted to maize. The winning entry in a strong class for export maize gave a weight of 65 lb. to the bushel, or 9 lb. above the standard. This sample was of the Durum variety, and was grown by Mr. L. D. Christensen, of Crow's Nest, who, incidentally, also captured the honours in the One Farm Display. Second prize went to a Ninety-Day sample, weighing 61 lb., exhibited by Mr. G. Meyers, of Imbil. Durum maize, which has won in this class on two previous occasions, is a cross between a dent and a flint type, and was evolved a few years ago by Mr. C. J. McKeon, maize specialist of the Department of Agriculture, especially to suit Atherton Tableland conditions.

# THE AVOCADO.

By R. ALLSOPP, Queensland Acclimatisation Society.

THE earliest known records indicate that this fruiting species of the Laurel family, the Avocado (*Persea gratissima*), was native only to sub-tropical America, with a distribution from Aztec Mexico through Mazan Guatemala to the Peru of the Incas. The term Alligator Pear, while a misnomer, is commonly applied to fruits from the West Indies. Calavo is the name chosen by the co-operative growers of California to designate the type of budded varieties that have been developed through many years of careful scientific bud selection. Avocado is the name selected by the U.S.A. Department of Agriculture, also the Avocado Association of California, the Department of Agriculture and Stock, Queensland, and most other countries where this valuable fruit is cultivated.

The Avocado comes under two headings—thin-skinned and thick-skinned. Both are rich in fat—from 12 to 15 per cent. Experience teaches us that many types are unsuitable for Queensland's climatic conditions, and it is only by cultivating those types which have proved themselves that any success will be gained. For instance, some trees will thrive for a few years and then die out; others will persist in carrying heavy loads of fruit and then die out; others, again, are subject to sun-blotch and transmit this susceptibility to seedlings, and many are subject to fly attack. It will be seen, therefore, that if we are to establish this desirable fruit in this State great care must be taken. Like all other fruits, the Avocado is simply another perishable product, and must be handled carefully. The miracle notion must be discarded by the grower. Selection of site, type of soil, and fertilization are just as important, and varieties even more so. Rich well-drained soil and protection from winds are essential.

Before giving the information regarding the location and other points in Avocado culture, I think it would be advisable to quote an extract from the "Avocado Journal" (U.S.A.), which should no doubt be a useful guide: "The Avocado is not merely a passing fancy, for its cultivation has been practised for hundreds of years. The first Avocados were introduced into Florida in 1883, and California in 1856. The Avocado did not gain popularity very rapidly until about 1900, when the public began to realise the relationship of diet to health and happiness. Because of its dietetic value and delicious flavour, the Avocado now stands out as the fruit sensation of modern agriculture. Avocado culture is enshrouded in romance and suggestive of tropical islands and of old Mexico. It radiates the lure of the tropics and beckons irresistibly to lovers of the great outdoors. Nature has endowed it with fine qualities, and, like a siren, it has snared many unsuspecting victims and robbed many an old couple of the nest egg that was to have seen them through. This, however, is no fault of the Avocado, but largely due to unethical promotion schemes and high-pressure salesmanship. Thousands of acres of land totally unfit for the raising of Avocados have been planted, subdivided, and sold to people weary of the hustle and bustle of city life. A few profess to hold the secret of successful Avocado-growing and other fruits in the palms of their hands, and if one buys trees from them they will lead you along the narrow but rosy patch to success. These growers, of whom, fortunately, there are but few, together with the unethical promoters of alleged wealth-winning enterprises, have misrepresented the industry to such an extent that many small holders have been ruined."

I think, in the light of the foregoing extract, it is most essential to choose wisely and well the position and study its soil requirements before planting the Avocado, or, in fact, any other fruit trees, for that is the first and most important step if any success is to be achieved. That is even more so in the case of new introduced fruits and other plants.

### Site of Avocado Orchard.

This should be an easy gentle slope, facing north-east and well protected from strong westerly winds. The soil should be at least 4 feet of rich loam with a sweet subsoil. The easy way to test a site is to dig out a hole from 3 to 4 feet deep and then fill it up with water; a good idea of what the subsoil is like may then be obtained by watching how the water soaks through.

### Planting.

The best planting distance is 30 feet by 30 feet, and will give the better results over a longer period.

**Varieties.**

*Thick Skin.*—This means tough and leathery. The skin is no thicker than the thin-skin types, the only difference being that the latter are soft and offer no resistance to pests, and in most cases are attractive to them, especially the fruit fly.

There are over 250 named Avocados; many have been discarded for various reasons—low fat content, crop failing, sun-blotch, a tendency to overcrop for two or three years and then fail, low resistance to pest attack—fruit fly and scales, and so on.

The Queensland Acclimatisation Society has from time to time imported many varieties of the Avocado. These have been planted in trial plots and those unsuitable discarded, while types which have been proved suitable and desirable are worked up. This practice is being continued and as an improved type appears this is worked up, and the best only are kept. Otherwise, like many other products, there would be far too many types which would have to be discarded later on. The names below indicate the Avocados that have proved themselves suitable to Queensland conditions:—

Campbelli.
''Fuerte'' Hybrid.
Blakeman. (Very good.)
Grande and Goodwood. (This fruit should be picked early and not let ripen on the tree.)
Justice. (Very good.)
Labourdonis. (Being tested out.)
Pankey (Queen). (Very good.)
Robinson. (Exceptionally good; largest fruiting.)
Wesser. (Being tested out.)
Wagner. (Being tested out.)
Spinke. (Very good.)

Worked trees will fruit from two years and always come true to type. As regards seedling trees, we cannot state any definite time of fruiting. Some may fruit in six years, while others have taken from twelve to sixteen years, and you must take what comes even then. All trees should be planted at the same depths at which they were growing when shifted from the nursery, and should be well watered and shaded until they can shade their own main stems. They should be headed back to form a good strong frame.

Fertilizer tests are being carried out and information on this point will be given later. Growers and intending growers should seek reliable information on all cultural and other points in the right quarter, rather than risk being misled as to the characteristics and requirements of the Avocado.

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## PIG IMPROVEMENT SCHEME.

Pig-raisers are reminded that application forms are now available, on written or personal request to the Department, for use in connection with the better boar subsidy scheme. There are two forms, one for use in cases where the farmer desires the Department to select and forward the boar and [or] sows, and the other in which the farmer desires to purchase the pig or pigs himself and needs financial assistance.

The subsidy scheme covers only Large and Middle White boars and sows, and is a special measure intended to focus attention on the importance of the white-skinned pigs for export.

When making application for forms, the applicant should state clearly the class or classes of pig he desires to purchase and state under which of the two headings he desires to be included. The maximum subsidy payable is £5 5s. for any one pig, or 50 per cent. of the purchase price of the animal if the subsidy is less than £5 5s.

Early application is desired, so that arrangements may be completed for delivery of the stock. Applications should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

# FODDER TREES AND PLANTS AT BUCKLETON, SPRINGSURE.

By MRS. ADA M. McLAUGHLIN.

*For some years past Mrs. McLaughlin has been sending specimens of the trees and plants of the Springsure district to the Government Botanist (Mr. C. T. White), and at his suggestion has put on record her observations on the fodder value of the trees, shrubs, and herbage of the district. Farmers are reminded that the Department is always willing to report on any specimens of trees, shrubs, and other plants sent in for identification.*—ED.

*Sterculia diversifolia,* Narrow-leafed Currajong. Eaten greedily by cattle, sheep, and horses. If fed to cattle with little other fodder, it has a very loosening effect on the bowels.

*Sterculia australe* (syn. *S. Trichosiphon*), Broad-leafed Currajong. Also useful, but not as reliable as the above because it sheds all its leaves in winter.

*Ehretia membranifolia.* Very good cattle feed. Sheep also eat it. Here we call it "Applewood."

*Bauhinia Hookerii* and *Bauhinia Carronii.* Liked by cattle particularly. They lick up the fallen flowers of *B. Carronii.*

*Bursaria incana,* "Prickly pine." Good feed for horses, cattle, and sheep.

*Ventilago viminalis,* Supple-jack. Cattle are fond of this.

*Geijera parviflora,* Wilga. Eaten by sheep and cattle. This is in tree form, called here "tree wilga." We have a wilga that grows as a bush; stock will not touch it.

*Acacia salacina,* "Willow wattle," known as "mimosa." Cattle like it.

*Alphitonia excelsa,* "Red Ash." Sheep and cattle eat it.

*Alstonia constricta,* "Native Quinine." Eaten by cattle.

*Santalum lanceolatum,* Plum Tree, True Sandalwood. Both sheep and cattle eat it readily. Not common here.

*Petalostigma quadri'oculare,* "Quinine Berry." Fair feed for sheep and cattle. Horses nibble at it a little.

*Atalaya hemiglauca,* "Whitewood." Known locally as "Dead Finish"; good sheep feed, not of much value for cattle, as the small twigs are not easily digested.

*Pittosporum phillyrœoides,* "Cattle Bush." Eaten by cattle.

*Erythrina vespertilio,* "Corkwood." Eaten by both sheep and cattle.

*Melaleuca,* "Tea-tree." Eaten by sheep and cattle, but contains very little nourishment.

*Capparis canescens,* "Wild Pomegranate." Liked by cattle and horses.

*Canthium oleifolium,* "Myrtle." Cattle eat it if very hungry.

*Grewia latifolia,* Wild Date. Nearly all stock are partial to these plants. Horses prefer them when the leaves are a little dry

*Acacia decora.* Cattle will eat the blossoms in a very dry time. Not of much value.

*Hovea longifolia.* Very common among the hills. Sheep strip the boughs of their leaves when very hungry. Not considered of much value.

*Celastrus bilocularis,* "Big Holly." Good sheep and cattle feed—one of the best.

*Acacia farnesiana,* "Wait-a-while Bush." Very useful sheep feed.

*Celastrus Cunninghamii.* Stock keep this eaten down to small bushes. Horses are very fond of it.

*Tribulus terrestris,* Calthrops, "Bull-head," or "Goats-head," is our most useful weed. It is excellent cattle feed, and all stock, particularly cattle and sheep, eat the dry stems long after the plant appears dead, and thrive on them.

*Trianthema decandra,* "Hogweed," is the next in value. It is more popular when nearly dry than when green.

*Boerhaavia diffusa,* "Tar-vine," or "Wild Verbena," is another valued weed. Horses are very partial to this.

# CROP PLANTING TABLES FOR QUEENSLAND.

## NUMBER OF PLANTS REQUIRED TO PLANT AN ACRE OF GROUND AT GIVEN DISTANCES.

| | Plants. | | Plants. |
|---|---|---|---|
| 3 in. × 12 in. .. .. | 174,240 | 18 in. × 42 in. .. .. | 8,297 |
| 6 in. × 6 in. .. .. | 174,240 | 18 in. × 48 in. .. .. | 7,260 |
| 6 in. × 9 in. .. .. | 116,160 | 20 in. × 24 in. .. .. | 13,068 |
| 6 in. × 12 in. .. .. | 87,120 | 20 in. × 30 in. .. .. | 10,454 |
| 9 in. × 9 in. .. .. | 77,440 | 20 in. × 36 in. .. .. | 8,712 |
| 9 in. × 12 in. .. .. | 58,080 | 20 in. × 42 in. .. .. | 7,467 |
| 12 in. × 12 in. .. .. | 43,560 | 20 in. × 48 in. .. .. | 6,534 |
| 12 in. × 15 in. .. .. | 34,848 | 2 ft. × 2 ft. .. .. | 10,890 |
| 12 in. × 18 in. .. .. | 29,040 | 2 ft. × 3 ft. .. .. | 7,260 |
| 12 in. × 24 in. .. .. | 21,780 | 2 ft. × 4 ft. .. .. | 5,445 |
| 12 in. × 30 in. .. .. | 17,424 | 2 ft. 6 in. × 3 ft. .. .. | 5,808 |
| 12 in. × 36 in. .. .. | 14,520 | 3 ft. × 3 ft. .. .. | 4,840 |
| 12 in. × 42 in. .. .. | 12,446 | 3 ft. × 4 ft. .. .. | 3,630 |
| 12 in. × 48 in. .. .. | 10,890 | 3 ft. 6 in. × 3 ft. .. .. | 4,148 |
| 15 in. × 18 in. .. .. | 23,232 | 4 ft. × 5 ft. .. .. | 2,178 |
| 15 in. × 24 in. .. .. | 17,424 | 4 ft. × 6 ft. .. .. | 1,815 |
| 15 in. × 30 in. .. .. | 13,939 | 4 ft. × 8 ft. .. .. | 1,361 |
| 15 in. × 36 in. .. .. | 11,616 | 4 ft. × 10 ft. .. .. | 1,089 |
| 15 in. × 42 in. .. .. | 9,956 | 4 ft. × 12 ft. .. .. | 907 |
| 15 in. × 48 in. .. .. | 8,712 | 6 ft. × 6 ft. .. .. | 1,210 |
| 18 in. × 18 in. .. .. | 19,360 | 6 ft. × 8 ft. .. .. | 907 |
| 18 in. × 24 in. .. .. | 14,520 | 6 ft. × 10 ft. .. .. | 726 |
| 18 in. × 30 in. .. .. | 11,616 | 6 ft. × 12 ft. .. .. | 605 |
| 18 in. × 36 in. .. .. | 9,680 | | |

The omission of the last figure will give the number required for 16 perches.

## TABLE OF EQUIVALENT QUANTITIES OF MANURES.

| Per Acre. | Per Square Perch, Approx. | Per Square Yard, Approx. |
|---|---|---|
| 1 ton | 14 lbs. | 7½ ozs. |
| 10 cwt. | 7 ,, | 3¾ ,, |
| 5 ,, | 3½ ,, | 2 ,, |
| 4 ,, | 2¾ ,, | 1½ ,, |
| 3 ,, | 2 ,, | 1 ,, |
| 2 ,, | 1½ ,, | |
| 112 lbs.—1 cwt. | 11¼ ozs. | |
| 84 ,, | 8½ ,, | |
| 56 ,, | 5½ ,, | |
| 28 ,, | 2¾ ,, | |

1 Dessert-spoonful equals about 1 oz.

## SOUTHERN DISTRICTS.

### Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

| Crop. | Purpose for which Grown. | When to Sow or Plant. Coastal Districts. | Tableland Districts. | Inland Districts. | How Sown or Planted. Distance Rows Apart. Ft. In. | Distance between Plants. Ft. In. | Quantity Seed per Acre if Drilled. | Quantity Seed per Acre if Broadcasted. | Approximate Period of Growth of Crop in Months. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| Arrowroot .. .. | Farina and pig food .. | Aug. to Oct. | .. | .. | 5 0 | 2 0 | Tubers or "bulbs" 10 to 12 cwt. | .. | 8 to 10 | Suited only to coastal districts. Tropical and semi-tropical. |
| Artichoke (Jerusalem) | Market sale and pig food | Aug. to Oct. | Sept. to Oct. | .. | 3 6 | 1 6 | 4 to 5 cwt. | .. | 4 to 5 | |
| Asparagus .. .. | Market sale .. .. | Aug. to Sept. | Sept. | .. | 4 0 | 1 6 | 7,260 roots | .. | 18 | May also be propagated from seed sown thinly in drills and transplanted when large enough. |
| Barley, Cape and Skinless | Green feed .. .. | Mar. to June | Mar. to July | Mar. to June | .. | .. | 1 bushel .. | 1½ bushel .. | 2 to 4 | |
| Barley, Malting .. | Grain .. .. .. | .. | May and June | May and June | .. | .. | 1 bushel .. | 1½ bushel .. | 4½ to 5 | |
| Beans, Broad .. | Market sale .. .. | May to June | Apr. to May | May to June | 2 6 | 0 6 | 2 bushels .. | .. | 4½ to 5 | |
| Beans, French .. | Market sale .. .. | Sept. to Apr. | Oct. to Mar. | Sept. to Mar. | 2 6 | 0 6 | 35 lb. small 52 lb. large | seeded seeded | 2½ to 3 | Sowings may be made earlier and later, according to the district's susceptibility to frosts. |
| Beans, Lima .. | Bush .. .. .. | Sept. to Apr. | Oct. to Jan. | Sept. to Jan. | 2 6 | 0 9 | 21 lb. small | seeded } | 3½ to 4 | |
| Do. do. .. | Runner.. .. .. | Sept. to Apr. | Oct. to Mar. | Sept. to Apr. | 4 0 | 1 0 | 26 lb. large | seeded } | | |
| Beet, Garden varieties | Market sale .. .. | Feb. to Apr. | Jan. to Mar. | .. | 2 0 | 0 9 | 4 to 5 lb. .. | .. | 3 to 4 | |
| Beet, Spinach .. | Stock food .. .. | Apr. to June | Apr. to June | .. | 2 6 | 1 0 | 4 lb. .. | .. | 3 to 4 | Foliage of Spinach Beet is reproduced quickly after being cut down and is a profitable crop for fattening purposes. |
| Broom Millet .. | Fibre for brushware .. | Sept. to Dec. | Oct. to Dec. | Oct. to Dec. | 3 6 | 0 9 | 4 to 5 lb. .. | .. | 4½ to 5 | |
| Buckwheat .. .. | Bees, green manure, grain, and poultry food | Sept. to Mar. | Sept. to Mar. | Sept. to Feb. | 2 0 | .. | 25 to 30 lb. | 40 to 45 lb. | 1½ to 2½ | Produces a valuable nectar crop within 6 to 7 weeks of planting. |
| Cabbage .. .. | Market and cattle food | Nearly all seasons except summer | Nearly all seasons except summer | Nearly all seasons except summer | 2 6 | 2 0 | 1 lb. .. | .. | 4 to 5 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Canary Seed .. .. | Hay and grain.. .. | .. | May to June | May to June | .. | .. | 15 lb. .. | .. | 4½ to 5 | |
| Capsicum .. .. | Market sale .. .. | Aug. to Oct. | Sept. to Oct. | Sept. to Oct. | 2 6 | 1 6 | 1 lb. .. | .. | 4 to 5 | |
| Carrot, Field .. | Stock food .. .. | Mar. to June | Apr. to May | Mar. to June | 1 9 | .. | 2 to 3 lb. .. | .. | 4 to 5 | |
| Carrot, Garden .. | Market sale .. .. | Nearly all seasons | Nearly all seasons | Sept. to May | 1 6 | .. | 2 to 3 lb. | .. | 4 | |
| Cassava (Tapioca) .. | Starch or pig food .. | Aug. to Sept. | .. | .. | 5 0 | 2 0 | 4,356 cuttings | .. | 8 to 10 | Boil before using. The water in which roots are boiled should not be used. |
| Cauliflower .. .. | Market sale .. .. | Feb. and Apr. | Feb. to May | Feb. to Mar. | 2 6 | 2 0 | 1 lb. .. | .. | 6 | |
| Celery .. .. | ditto .. .. | Jan. to Mar. | Jan. to Mar. | .. | 4 0 | 0 6 | 4 oz. .. | .. | 5 to 6 | |
| Chocos .. .. | ditto .. .. | Aug. to Oct. | .. | .. | Trellis | .. | Chocos .. | .. | 4 to 5 | |
| Cotton .. .. | Fibre .. .. .. | Sept. to Dec. | Sept. to Nov. | Sept. to Nov. | 4 0 | 2 0 | 5 to 6 lb. .. | .. | 4 to 4½ | Early cultivation is essential to keep down weeds and grass. |
| Cow Cane .. .. | Cattle food .. .. | Sept. to Dec. | .. | .. | 5 0 | 1 6 | 5,800 sets | .. | 7 to 8 | |
| Cowpea .. .. | Grain, hay, or green manure | Sept. to Jan. | Oct. to Jan. | Oct. to Jan. | 3 0 | 0 8 | 10 lb. .. | 15 to 20 lb. | 4 to 4½ | The non-running varieties are the most suitable for grain. |
| Cucumber .. .. | Market sale .. .. | Sept. to Jan. | Oct. to Jan. | Sept. to Jan. | 5 0 | 2 0 | 1 lb. .. | .. | 3 | |
| Egg Plant .. .. | ditto .. .. | Sept. and Oct. | Sept. and Oct. | Sept. and Oct. | 3 0 | 3 0 | 1 oz. for 1,000 plants | .. | 6 | |
| Garlic .. .. | ditto .. .. | Aug. to Sept. | Aug. to Sept. | .. | 1 6 | 0 6 | .. | .. | 6 | |
| Ginger .. .. | ditto .. .. | Aug. to Sept. | .. | .. | 3 0 | 1 0 | 5 to 6 cwt. | .. | 10 | |
| Grasses— | | | | | | | | | | |
| Cocksfoot .. .. | Pasture.. .. .. | .. | Apr. to May | .. | .. | .. | .. | 1½ bushel .. | | |
| Elephant Grass .. | Green fodder before the stems harden | Aug. to Oct. | .. | .. | 5 0 | 2 6 | (3,432) cuttings of stem | .. | 4 to 5 | Can be cut at intervals during each season until unprofitable. Also propagated from seed. |
| Italian Rye Grass | Pasture.. .. .. | .. | Apr. to May | .. | .. | .. | .. | 2 bushels | 4 to 6 | Sow in rainy season. |
| Paspalum .. | ditto .. .. | Sept. to Jan. | Sept. to Jan. | .. | .. | .. | .. | 8 to 10 lb. | | |
| Perennial Rye Grass | ditto .. .. | .. | Apr. to May | .. | .. | .. | .. | 2 bushels | 4 to 5 | |
| Prairie .. .. | ditto .. .. | Apr. to May | Apr. to May | Apr. to May | .. | .. | .. | 1½ to 2 bus. | 4 to 6 | Sow in rainy season. |
| Rhodes .. .. | ditto .. .. | Sept. to Jan. | Sept. to Jan. | Sept. to Jan. | .. | .. | .. | 4 to 5 lb. .. | | |
| Herbs— | | | | | | | | | | |
| Lavender .. .. | Perfume .. .. | Aug. to Sept. | Aug. to Sept. | .. | 4 0 | 2 0 | .. | .. | 12 | Propagated from seed or by division of rootlets. |
| Marjoram .. | Seasoning .. .. | Aug. to Sept. | Aug. to Sept. | Aug. to Sept. | 2 6 | 0 6 | .. | .. | 3 | Propagated from seed or by division of rootlets. |
| Mint .. .. | ditto .. .. | Aug. to Sept. | Aug. to Sept. | .. | .. | .. | .. | .. | 2 | Propagated by rootlets only. |
| Parsley .. .. | ditto .. .. | Nearly all seasons | Nearly all seasons | .. | 2 6 | .. | 1 lb. .. | .. | 2½ to 3½ | |

## SOUTHERN DISTRICTS—*continued.*

| Crop. | Purpose for which Grown. | When to Sow or Plant. Coastal Districts. | When to Sow or Plant. Tableland Districts. | When to Sow or Plant. Inland Districts. | How Sown or Planted. Distance Rows Apart. Ft. In. | How Sown or Planted. Distance between Plants. Ft. In. | How Sown or Planted. Quantity Seed per Acre if Drilled. | How Sown or Planted. Quantity Seed per Acre if Broadcasted. | Approximate Period of Growth of Crop in Months. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| HERBS—*continued.* | | | | | | | | | | |
| Sage | Seasoning | Aug. to Sept. | Aug. to Sept. | .. | 2 6 | 0 9 | 2 lb. | .. | 3 | Propagated from seed or by division of rootlets. |
| Thyme | Seasoning | Aug. to Sept. | Aug. to Sept. | Aug. to Sept. | 2 6 | 0 6 | .. | .. | 3 | Propagated from seed or by division of rootlets. |
| Kale | Stock food | Feb. to June | Feb. to June | .. | 3 0 | 2 0 | 1 lb. | .. | 4 | |
| Kohl Rabi | Market sale, stock food | Mar. to Apr. | Mar. to Apr. | .. | 2 6 | 1 6 | 2 lb. | .. | 4 to 5 | |
| Leek | Market sale | Feb. to Apr. | Feb. to Apr. | .. | 2 6 | 0 6 | 2 lb. | .. | 6 to 8 | Transplanted when the leeks are the size of goose quills. |
| Lettuce | ditto | All seasons | All seasons | .. | 2 0 | 0 9 | ½ lb. | .. | 3 | During dry periods of year sow in drills and thin out. |
| Linseed (Flax) | Fibre and grain | May and June | May and June | .. | Drilled | .. | 30 lb. for grain 60 lb. for fibre | .. | 4½ to 5 | Can be treated as an ordinary white cereal crop and harvested with reaper and binder. |
| Lucerne | Fodder | April to May | April to May | .. | Drilled | .. | 12 to 14 lb. | 16 to 20 lb. | 1½ to 2 | First cutting should take place as soon as the plant will stand up to the mower and before it flowers. |
| Maize | Grain and silage | Aug. to Jan. | Sept. to Jan. | Sept. to Jan. | 4 0 | 1 3 | 8 to 10 lb. | .. | 4 to 5 | If sown on the "check row" system weeds are more easily dealt with. |
| Mangel and Sugar Beet | Stock food | Feb. to Apr. | Mar. to June | .. | 2 6 | 1 0 | 5 to 7 lb. | .. | 6 to 7 | |
| Marrow, Vegetable | Market sale | Aug. to Jan. | Sept. to Jan. | Sept. to Jan. | 4 to 8 feet | 4 0 | 2 lb. | .. | 3 to 4 | Distance apart and time of maturing according to variety grown. |
| Melon, Rock | ditto | Aug. to Jan. | Sept. to Dec. | Sept. to Dec. | 4 to 6 feet | 2 0 | 1 lb. | .. | 3 | Distance apart and time of maturing according to variety. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Melon, Water .. | Market sale .. .. | Aug. to Jan. | Sept. to Jan. | Sept. to Jan. | 4 to 6 feet | 2 0 | 2 lb. .. | .. | 3 to 4 | Distance apart and time of maturing according to variety. |
| Millet, Foxtail varieties, these include the so-called Giant Panicum | Fodder .. .. .. | Sept. to Jan. | Oct. to Jan. | Sept. to Jan. | Drilled | .. | 10 to 14 lb. | .. | 2 | Should be cut for hay before the seed forms. |
| Millets, French .. | Grain and green fodder | Sept. to Jan. | Sept. to Jan. | Sept. to Jan. | Drilled | .. | 7 to 8 lb. .. | .. | 1½ to 2 | A useful catch crop. |
| Mustard .. .. | Market sale .. .. | All seasons .. | All seasons .. | .. | Sown in beds | | for salad use | .. | .. | For farm use, see remarks under Rape. |
| Oats .. .. | Grain and fodder .. | Apr. to June | Apr. to June | Apr. to June | Drilled | .. | 1¼ bushel .. | 1½ to 2 bus. | 3 to 5 | |
| Onion .. .. | Market sale .. .. | Apr. to May .. | Mar. to Apr. | Mar. to Apr. | 1 0 | .. | 4 lb. .. | .. | 5 to 6 | |
| Panicum (White) and Japanese Millet | Silage, fodder, and grain | Aug. to Feb. | Sept. to Feb. | Sept. to Feb. | Drilled | .. | 10 to 14 lb. | .. | 2 | Should be cut for hay before the seed forms. |
| Parsnip .. .. | Market sale .. .. | Feb. to Mar. | Feb. to Mar. | .. | 2 0 | .. | 1 lb. .. | .. | 6 to 7 | |
| Pea, Field .. .. | Fodder .. .. | Mar. to June | Mar. to June | Apr. to June | 2 0 | .. | ½ to ¾ bus. | .. | 4 to 5 | Usually combined with a cereal fodder crop. |
| Pea, Garden .. .. | Market sale .. .. | Feb. to Sept. | Mar. to Sept. | Mar. to June | 2 0 | .. | 1½ bushel .. | .. | 3½ to 4 | Period of maturity according to variety used. |
| Peanut .. .. | ditto .. .. | Aug. to Jan. | Sept. to Dec. | Sept. to Dec. | 3 0 | 1 3 | 30 to 35 lb. | .. | 5 | |
| Potato .. .. | ditto .. .. | Aug. and Feb. | Aug. and Feb. | .. | 2 6 | 1 0 | 8 to 9 cwt. | .. | 3 to 4 | |
| Potato, Sweet .. | ditto .. .. | Aug. to Jan. | Sept. to Jan. | Sept. to Jan. | 3 to 3½ feet | 1 6 | 9,000 cuttings | .. | 3 to 4 | |
| Pumpkin .. .. | Fodder and market sale | Aug. to Jan. | Sept. to Jan. | Sept. to Jan | 8 to 10 feet | 3 0 | 2 lb. .. | .. | 5 or 6 | Distance apart and time of maturing varies according to variety. |
| Radish .. .. | Market sale .. .. | Nearly all seasons | Nearly all seasons | Nearly all seasons | 1 0 apart | .. | 10 to 12 lb. | .. | 1½ | |
| Rape .. .. | Fodder and green manure | Mar. to May | Mar. to May | .. | Drilled | .. | 5 to 6 lb. .. | .. | 2½ to 4 | The addition of 1 lb. of mustard seed to every 5 or 6 lb. will, if sown in conjunction, minimise the tendency of depastured animals to bloat. |
| Rhubarb .. .. | Market sale .. .. | Aug. to Oct. | Sept. to Nov. | .. | 4 0 | 4 0 | 1½ lb. .. | .. | 4 to 5 | When propagated from roots quicker returns may be expected. |
| Rice, Upland .. | Grain and fodder .. | Oct. to Jan. | .. | .. | Drilled | .. | 12 to 16 lb. | .. | 4 to 5 | |
| Rosella .. .. | ditto .. .. | Aug. to Nov. | Sept. to Oct. | .. | 4 0 | 3 0 | Sow in beds and transplant | .. | 3 to 4 | |
| Rye .. .. | Fodder .. .. | Mar. to June | Apr. to June | Apr. to June | Drilled | .. | ¾ to 1 bushel | .. | 3 to 5 | |

## SOUTHERN DISTRICTS—*continued.*

| Crop. | Purpose for which Grown. | When to Sow or Plant. Coastal Districts. | When to Sow or Plant. Tableland Districts. | When to Sow or Plant. Inland Districts. | How Sown or Planted. Distance Rows Apart. Ft. In. | How Sown or Planted. Distance between Plants. Ft. In. | How Sown or Planted. Quantity Seed per Acre if Drilled. | How Sown or Planted. Quantity Seed per Acre if Broadcasted. | Approximate Period of Growth of Crop in Months. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| Shallots .. .. | Market sale .. .. | Nearly all seasons | Nearly all seasons | .. | 1 6 | 0 6 | .. | .. | 3 to 4 | Propagated by division of the bulbs. |
| Sorghum, Feed .. | Fodder and silage .. | Aug. to Feb. | Sept. to Feb. | Sept. to Jan. | 3 6 | 0 8 | 4 to 5 lb. .. | .. | 3½ to 5 | Maturity depends on variety used. |
| Sorghum, Grain .. | Grain .. .. .. | Aug. to Feb. | Sept. to Jan. | Sept. to Jan. | 3 6 | 0 8 | 3 to 4 lb. .. | .. | 3½ to 5 | |
| Soudan Grass .. | Fodder or silage .. | Sept. to Feb. | Sept. to Jan. | Sept. to Dec. | 2 6 | .. | 3 to 4 lb. .. | .. | 2 | Closer planting permissible. |
| Soy Beans .. .. | Grain .. .. .. | Sept. to Jan. | Oct. to Jan. | .. | 2 6 | 0 8 | 8 to 10 lb. | .. | 3 | |
| Squash .. .. | .. | *See* Marrows | and Pumpkins. | | | | | | | |
| Swede .. .. | Market sale and stock food | Feb. to May | Feb. to May | .. | 2 0 | 1 0 | 2 lb. .. | .. | 4 to 5 | |
| Sweet Corn .. .. | Market sale .. .. | Aug. to Jan. | Sept. to Jan. | .. | 3 6 | 1 3 | 8 to 10 lb. | .. | 3 | |
| Tares .. .. | Fodder or green manure | Mar. to June | Mar. to June | .. | Drilled | .. | 1 bushel .. | ½ bushel to 1 bushel other grain | 3 to 4 | For fodder purposes is best used with some form of cereal, such as barley, wheat, or rye. |
| Tobacco .. .. | Leaf .. .. .. | Oct. to Jan. | Oct. to Feb. | Oct. to Jan. | 4 0 | 1 ft. 8 in. to 2 ft. | 1 oz. in seed beds | .. | 3 to 4 | Plants must be raised in specially prepared seed beds and transplanted when strong enough to permanent positions. |
| Tomato .. .. | Market sale .. .. | Aug. to Feb. | Sept. to Jan. | Sept. to Jan. | 4 0 | 2 0 | ¼ lb. .. | .. | 3 to 4 | |
| Turnip, Field .. | Stock food .. .. | Feb. to June | Feb. to June | .. | 2 0 | 1 0 | 2 to 3 lb. .. | .. | 3 to 4 | |
| Turnip, Garden .. | Market sale .. .. | Feb. to June | Feb. to June | .. | 2 0 | 0 6 | 2 lb. .. | .. | 2 to 3 | |
| Wheat .. .. | Grain and hay .. .. | Apr. to May | Apr. to July | Apr. to June | Drilled | .. | ¾ bushel .. | 1 bushel .. | 3 to 4 | Fodder purposes only on coast. |

## CENTRAL DISTRICTS.

### Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

| Crop. | Purpose for which Grown. | When to Sow or Plant. | | How Sown or Planted. | | | | Approximate Period of Growth of Crop in Months. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Coastal Districts. | Tableland and Inland Districts. | Distance Rows Apart. | Distance between Plants. | Quantity Seed per Acre if Drilled. | Quantity Seed per Acre if Broadcasted. | | |
| | | | | Ft. In. | Ft. In. | | | | |
| Arrowroot | Farina and pig food | Aug. to Nov. | .. | 5 0 | 2 0 | 10 to 12 cwt. | .. | 8 to 10 | Propagated by small "bulbs" or tubers. |
| Artichoke (Jerusalem) | Market sale and pig food | Aug. to Nov. | Sept. to Nov. | 3 6 | 1 6 | 4 to 5 cwt. | .. | 4 to 5 | |
| Asparagus | Market sale | Aug. | .. | 4 0 | 1 6 | 7,260 sets | .. | 18 | Propagated from seed or division of roots. |
| Barley (Cape and Skinless) | Green feed | Mar. to June | Mar. to June | Drilled | 0 7 | 1 bushel | 1½ bushel | 2 to 4 | |
| Beans, French | Market sale | July to Apr. | Sept. to Jan. | 2 6 | 0 6 | .. | 35 lb. small 52 lb. large | 2 to 3 | |
| Beans, Broad | ditto | May to June | .. | 2 6 | 0 6 | 2 bushels | .. | 4 to 5 | |
| Beans, Lima | ditto | July to Jan. | Sept. to Dec. | 4 0 | 1 0 | 26 lb. large seeded | .. | 3 to 4 | |
| Beetroot | ditto | Feb. to Aug. | Sept. to Dec. | 2 6 | 0 9 | 4 to 5 lb. | .. | 3 to 4 | |
| Beet, Silver or Spinach | Market sale or stock food | All seasons | Apr. to June | 2 6 | 1 0 | 4 lb. | .. | 3 | Useful both as a vegetable and as a stock food. |
| Broom Millet | Fibre for brushware | Aug. to Jan. | Sept. to Dec. | 3 6 | 0 9 | 4 to 5 lb. | .. | 4 to 5 | |
| Buckwheat | Bees, green manure, poultry food, and grain | Aug. to Jan. | Sept. to Dec. | 2 0 | .. | 25 to 30 lb. | 40 to 45 lb. | 1½ to 2½ | Produces a valuable nectar crop within 6 or 7 weeks of planting. |
| Cabbage | Market sale | Feb. to June | Feb. to June | 3 0 | 2 0 | 1 lb. | .. | 4 to 5 | |
| Canary Seed | Grain or hay | Mar. to June | Mar. to June | Drilled | .. | 15 lb. | .. | 4½ to 5 | Also used as green stuff. |
| Capsicum | Market sale | Aug. to Nov. | Sept. to Nov. | 3 0 | 2 to 3 ft. | 1 lb. | .. | 4 to 4½ | Distance apart according to variety. |
| Carrot, Field | Stock food | Mar. to June | Sept. to Jan. | 1 9 | .. | 3 lb. | .. | 4 to 5 | |
| Carrots, Garden | Market sale | Mar. to June | Sept. to Jan. | 1 6 | .. | 3 to 4 lb. | .. | 3 to 4 | |
| Cassava (Tapioca) | Starch or pig food | July to Sept. | .. | 5 0 | 2 0 | Cuttings | .. | 8 to 10 | Boil before using. The water in which roots are boiled should not be used. |
| Cauliflower | Market sale | Feb. to May | Feb. to May | 3 0 | 2 0 | 1 lb. | .. | 5 to 6 | |
| Celery | ditto | Feb. to Mar. | Feb. to Mar. | 4 0 | 0 6 | 4 oz. | .. | 6 | |
| Chocos | ditto | July to Nov. | Sept. to Nov. | Trellis | 6 0 | .. | .. | 4 | |

## CENTRAL DISTRICTS—*continued.*

| Crop. | Purpose for which Grown. | When to Sow or Plant. | | How Sown or Planted. | | | | Approximate Period of Growth of Crop in Months. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Coastal Districts. | Tableland and Inland Districts. | Distance Rows Apart. | Distance between Plants. | Quantity Seed per Acre if Drilled. | Quantity Seed per Acre if Broadcasted. | | |
| | | | | Ft. In. | Ft. In. | | | | |
| Cotton | Fibre | July to Oct. | Sept. to Oct. | 4 0 | 2 to 3 ft. | 5 lb. | .. | 4 to 5 | |
| Cow Cane | Cattle food | Sept. Oct. and in Mar. | .. | 5 0 | 1 6 | 5,800 sets | .. | 7 to 8 | |
| Cowpea | Hay or green manure | Aug. to Feb. | Sept. to Jan. | 3 0 | 0 8 | 9 to 10 lb. | 15 lb. | 4 to 4½ | |
| Cucumber | Market sale | July to Jan. | Aug. to Dec. | 4 0 | 2 0 | 1 lb. | .. | 3 | |
| Egg Plant | ditto | July to Oct. | Aug. to Oct. | 3 0 | 1 6 | .. | 1 oz. for 1,000 plants | 6 | |
| Garlic | ditto | Mar. to May | .. | 1 6 | 4 to 6 in. | .. | .. | 6 | |
| Ginger | ditto | Aug. to Nov. | .. | 3 0 | 1 0 | 5 to 6 cwt. | .. | 9 to 10 | |
| GRASSES— | | | | | | | | | |
| Elephant | Green fodder, before the stems harden | Jan. to Mar. Aug. to Oct. | .. | 5 0 | 2 6 | 3,432 cuttings of stem | .. | 4 to 5 | Can be cut at intervals during each season until unprofitable. (Also propagated from seed.) |
| Paspalum | Pasture | Aug. to Dec. Jan. to Mar. | .. | .. | .. | .. | 8 to 10 lb. | 4 to 6 | Is established more readily in the wet season, Jan. to Mar. |
| Prairie | ditto | Mar. to Apr. | .. | .. | .. | .. | 1½ bushel | 4 to 5 | Only suitable for localities favoured with winter rains. |
| Rhodes | ditto | Aug. to Dec. | .. | .. | .. | .. | 4 to 5 lb. | 4 to 6 | Seed germinates readily in the wet season, Jan. to Mar., and in cloudy weather. |
| Kohl Rabi | Market sale | Mar. to May | .. | 2 6 | 1 6 | 2 lb. | .. | 3 to 4 | |
| Leek | Domestic use | Mar. to May | .. | 2 6 | 0 6 | 2 lb. | .. | 6 to 8 | |
| Lettuce | Market sale | Mar. to Sept. | .. | 2 0 | 0 9 | ½ lb. | .. | 3 | |
| Linseed (Flax) | Seed | Apr. to June | .. | Drilled | .. | 25 to 30 lb. | .. | 4½ to 5 | |
| Lucerne | Hay and green stuff | Apr. to June | .. | Drilled | .. | 12 to 14 lb. | 16 to 20 lb. | Perennial | |
| Maize | Grain and silage | Aug. to Jan. | Sept. to Dec. | 4 0 | 1 3 | 8 to 10 lb. | .. | 4 to 5 | For silage in forest country and in freshly cleared scrub lands, 10 to 15 lb. of seed per acre. |
| Mangel and Sugar Beet | Stock food | Mar. to June and in Aug. | Sept. to Oct. | 2 6 | 1 6 | 5 to 7 lb. | .. | 6 to 7 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Marrow, Vegetable .. | Market sale .. .. .. | July to Mar. | Sept. to Jan. | 4 to 8 ft. | 3 0 | 2 lb. .. | .. | 3 to 4 | Distance apart and time of maturing according to variety. |
| Melon, Rock .. | ditto .. .. .. | July to Sept. | Sept. to Oct. | 4 to 6 ft. | 2 0 | 1 lb. .. | .. | 3 | Distance apart and time of maturing according to variety. |
| Melon, Water .. | ditto .. .. .. | July to Oct. | Sept. to Oct. | 4 to 6 ft. | 2 0 | 2 lb. .. | .. | 3 to 4 | |
| Millet, Foxtail varieties, these include the so-called Giant Panicum | Hay and silage .. .. | Aug. to Jan. | Sept to Dec. | Drilled | .. | 10 to 14 lb. | .. | 2 | Should be cut for hay before the seed forms. |
| Millets, French .. | Grain and green fodder .. | Aug. to Feb. | Sept. to Jan. | Drilled | .. | 7 to 8 lb. .. | .. | 1½ to 2 | |
| Oats .. .. | Hay and green stuff .. .. | Apr. to June | Apr. to June | Drilled | .. | 1¼ bushel .. | 1½ to 2 bus. | 4 to 5 | |
| Onion .. .. | Market sale .. .. .. | Apr. to June | Apr. to June | 1 0 | 0 4 | 4 lb. .. | .. | 6 | |
| Panicum (White) and Japanese Millet | Silage, hay, and green stuff .. | Aug. to Feb. | Aug. to Feb. | Drilled | .. | 14 to 16 lb. | .. | 2 | Should be cut for hay before seed forms. |
| Parsley .. .. | Market sale .. .. .. | Nearly all seasons | Nearly all seasons | 2 6 | .. | 1 lb. .. | .. | 2½ to 3½ | |
| Parsnip .. .. | ditto .. .. .. | Mar. to Apr. | Mar. to Apr. | 2 0 | 0 6 | 1 lb. .. | .. | 6 to 7 | |
| Pea, Field .. .. | Fodder .. .. .. | Mar. to June | Apr. to June | 2 0 | .. | ½ to ¾ bus. | .. | 4 to 5 | Invariably sown with a cereal, half bushel field pea, 1 bushel wheat, &c. |
| Pea, Garden .. .. | Market sale .. .. .. | Mar. to June | Apr. to June | 2 0 | .. | 1½ bushel .. | .. | 3½ to 4 | Period of growth according to variety. |
| Peanut .. .. | ditto .. .. .. | Aug. to Nov. | Sept. to Nov. | 3 0 | 1 3 | 30 to 35 lb. | .. | 5 | |
| Potato .. .. | ditto .. .. .. | July and Feb. | Aug. and Feb. | 3 0 | 1 0 | 8 cwt. .. | .. | 3 to 4 | |
| Potato, Sweet .. | ditto .. .. .. | Aug. to Dec. | Sept. to Nov. | 3 to 4 ft. | 1 6 | 9,000 cuttings | .. | 3 to 4 | |
| Pumpkin .. .. | Market sale and stock food .. | July to Nov. | Sept. to Nov. | 8 to 10ft. | 4 0 | 2 lb. .. | .. | 5 to 6 | Distance apart and period of growth varies according to variety. |
| Radish .. .. | Market sale .. .. .. | All seasons .. | All seasons .. | 1 0 | 0 3 | 10 to 12 lb. | .. | 1½ | |
| Rape .. .. | Fodder and green manuring .. | Mar. to June | .. | Drilled | .. | 3 to 4 lb. .. | 6 to 8 lb. .. | 4 to 5 | Can be grazed off in 6 to 8 weeks. Should be sown with 1 lb. mustard to every 5 or 6 lb. or rape seed to prevent bloat. |
| Rhubarb .. .. | Market sale .. .. .. | Aug. to Sept. | .. | 4 0 | 4 0 | Roots .. | .. | 2 | |
| Rice, Upland .. | Grain or hay .. .. .. | Oct. to Dec. | .. | Drilled | .. | 20 lb. .. | .. | 4 to 5 | |
| Rosella .. .. | Market sale .. .. .. | Aug. to Oct. | .. | 4 0 | 3 0 | .. | .. | 3 to 4 | |
| Rye .. .. | Fodder .. .. .. | Mar. to June | .. | Drilled | .. | ¾ bushel .. | .. | 3 to 5 | |
| Shallot .. .. | Market sale .. .. .. | All seasons .. | All seasons .. | 1 6 | 0 6 | .. | .. | .. | Propagated by division of the bulbs. |
| Sorghum, Feed .. | Fodder and silage .. .. | Aug. to Feb. | Sept. to Dec. | 3 6 | 0 8 | 4 to 5 lb. .. | .. | 3 to 4 | Period of growth varies according to variety. |

## CENTRAL DISTRICTS—*continued.*

| Crop. | Purpose for which Grown. | When to Sow or Plant. Coastal Districts. | When to Sow or Plant. Tableland and Inland Districts. | How Sown or Planted. Distance Rows Apart. | How Sown or Planted. Distance between Plants. | How Sown or Planted. Quantity Seed per Acre if Drilled. | How Sown or Planted. Quantity Seed per Acre if Broadcasted. | Approximate Period of Growth of Crop in Months. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Ft. In. | Ft. In. | | | | |
| Sorghum, Grain .. | Grain .. .. .. | Aug. to Feb. | Sept. to Dec. | 3 6 | 0 8 | 4 lb. .. | .. | 4 | Period of maturing according to variety. |
| Soudan Grass .. | Hay or silage .. .. .. | Aug. to Jan. | Sept. to Dec. | 2 6 | .. | 3 to 4 lb. .. | .. | 2 to 3 | On clean land drills may be 14 in. apart, 8 to 9 lb. of seed being required. |
| Soy Beans .. .. | Grain .. .. .. | Aug. to Jan. | .. | 2 6 | 0 8 | 10 lb. .. | .. | 3 to 4 | |
| Squash .. .. | .. | .. | .. | .. | .. | *See* Marrows and Pumpkins. | | | |
| Sunflower .. .. | Grain .. .. .. | Aug. to Nov. | Sept. to Nov. | 4 0 | 1 6 | 6 lb. .. | .. | 4 to 5 | |
| Swede .. .. | Market sale and stock food .. | Mar. to June | .. | 2 0 | 1 0 | 2 to 3 lb. .. | .. | 3 to 4 | |
| Sweet Corn .. .. | Market sale .. .. .. | Aug. to Jan. | Sept. to Jan. | 3 to 4 ft. | 1 0 | 8 to 10 lb. | .. | 3 | Should be planted when the flowering season will not coincide with that of ordinary maize planted alongside. |
| Tares .. .. | Fodder or green manure .. | Mar. to June | .. | Drilled | .. | 1¼ bushel .. | ½ bushel with 1 bushel cereals | 4 | |
| Tobacco .. .. | Leaf .. .. .. | Oct. to Jan. | Oct. to Feb. | 4 0 | 1 ft. 8 in. to 2 ft. | 1 oz. in seed beds | Transplanted | 3 to 4 | |
| Tomato .. .. | Market sale .. .. .. | All seasons .. | Aug. to Dec. | 4 0 | 2 0 | ¼ lb. .. | Transplanted | 3 to 4 | |
| Turnip, Field .. | Stock food .. .. .. | Mar. to June | .. | 2 0 | 1 0 | 2 to 3 lb. .. | .. | 3 | |
| Turnip, Garden .. | Market sale .. .. .. | Mar. to July | .. | 2 0 | 0 6 | 2 lb. .. | .. | 2 to 3 | |
| Wheat .. .. | Hay or green fodder .. .. | Apr. to June | Apr. to June | Drilled | .. | 1 bushel .. | 1½ bushel .. | 4 to 5 | For costal districts, only rust-resisting hay wheats suitable. |

## NOTES ON NORTHERN SEED TABLES.

The Northern districts vary greatly in their rainfall; also in the quantities that fall in each month. Thus, on the coastal strip Mackay and Proserpine enjoy a greater and better distributed rainfall than Bowen, the lower Burdekin, and Townsville; while from Ingham through to Cairns much the heaviest rainfall in the State is experienced. Similarly, on the Tablelands certain areas, such as Ravenshoe, Millaa Millaa, and along the watershed of the Johnstone and Russell Rivers and near the crest of the coastal range, a much heavier and better distributed rainfall obtains than a little further back.

The inland districts are not so variable as the coastal areas in their periods and quantity of rainfall.

The compilation of the present table must be looked at as a general guide and sowings made with regard to the season generally experienced in a particular locality. Generally, crops are best planted at the commencement of the monsoonal rains or wet season, starting usually in November or December. Other plantings are made towards the close of the wet season or when extra heavy rains will not cause injury to the growing crop. When about to plant, growers should consider the month the crop is likely to be harvested and arrange accordingly.

In districts of heavy rainfall many root crops, even on well-drained land, are liable to rot out. In potato planting on the Tablelands and inland it is advisable to plant before the wet season commences. The tubers will make a certain amount of root-growth, and shoots will appear on the surface in a short time after the first shower. Growth is then rapid, and when the heavier rains fall the foliage can better cope with excess moisture. The crop planted before the wet season begins always gives a heavier yield and better tubers than one planted after it.

On the Tablelands another planting can be made in February or March. Seed grown from this crop can be held for planting the main crop in October.

It is well to note that whole sets are always preferable in North Queensland to cut tubers.

## NORTHERN AND TABLELAND DISTRICTS.

### Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

| Crop. | Purpose for which Grown. | When to Sow or Plant. Coastal Districts. | Tableland Districts. | Inland Districts. | How Sown or Planted. Distance Rows Apart. Ft. In. | Distance between Plants. Ft. In. | Quantity Seed per Acre if Drilled. | Quantity Seed per Acre if Broadcasted. | Approximate Period of Growth of Crop in Months. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| Arrowroot .. .. | Farina and pig food .. | Aug. to Nov. | Aug. to Jan. | Oct. to Jan. | 5 0 | 3 6 | 2,000-2,500 sets | .. | 8 to 10 | Fresh land should be planted each year. |
| Artichoke (Jerusalem) | Stock food .. .. | July tó Aug. | July to Dec. | July to Dec. | 3 6 | 1 6 | 4 to 5 cwt. | .. | 4 to 5 | Difficult to store; will keep better in the soil. |
| Asparagus .. .. | Domestic use .. .. | .. | Sept. .. | .. | 4 0 | 1 6 | 7,260 roots | .. | .. | Suited only to the Tablelands and comparatively cooler districts. |
| Barley, Cape and Skinless | Green feed .. .. | Mar. to May | Feb. to May | Feb. to Mar. | .. | .. | 1 bushel .. | 1½ bushel .. | 3 | |
| Beans, French .. | Market sale .. .. | Apr. to Aug. | Aug. to Apr. | Feb. to Aug. | 2 0 | 0 6 | 1 qt. to 100 ft. of drill | .. | 2½ to 3 | |
| Beans, Lima .. | ditto .. .. | Mar. to Apr. | Dec. to Jan. | Nov. to Jan. | 4 0 | 1 3 | 26 lb. .. | .. | 4 to 5 | Only advisable as a field crop where fine weather can be depended on for harvesting. |
| Beet, Silver or Spinach | Stock food .. .. | Mar. to Aug. | Feb. to Sept. | Feb. to July | 2 6 | .. | 4 to 5 lb. .. | .. | 3 | |
| Beetroot .. .. | Domestic use .. .. | Mar. to Aug. | Feb. to Sept. | Feb. to July | 2 6 | 0 9 | 4 lb. .. | .. | 3 | |
| Broom Millet .. | Brushware .. .. | Feb. to Mar. | Dec. to Feb. | Dec. to Feb. | 3 4 | 0 9 | 4 to 5 lb. .. | .. | 4 | |
| Buckwheat .. .. | Fodder, grain, and green manure | .. | Dec. to Apr. | Dec. to Apr. | 2 0 | .. | 25 to 30 lb. | 40 to 45 lb. | 1½ to 2½ | |
| Cabbage .. .. | Market sale .. .. | Feb. to July | Jan. to Aug. | Jan. to Aug. | 2 6 to 3 0 | 2 0 | 1 lb. .. | .. | 4 | |
| Capsicum .. .. | Domestic use .. .. | July to Oct. | Sept. to Oct. | Sept. to Oct. | 3 0 | 2 0 | 1 lb. .. | .. | 4 to 5 | Where districts are free from frost these may be planted all the year round. |
| Carrots, Field .. | Stock food .. .. | .. | Feb. to Aug. | Feb. to Apr. | 2 0 | .. | 3 to 4 lb. .. | .. | 4 to 5 | |
| Carrots, Garden .. | Market sale .. .. | Feb. to Oct. | Feb. to Oct. | Feb. to Oct. | 1 6 | .. | 4 lb. .. | .. | 4 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Cassava (Tapioca) .. | Starch, or pig food .. | July to Sept. | Sept. to Oct. | .. | 5 0 | 2 0 | 4,356 cuttings | .. | 8 to 10 | Boil before using. The water in which roots are boiled should not be used. |
| Cauliflower .. .. | Market sale .. .. | .. | Jan. to Mar. | Jan. to Feb. | 3 0 | 2 0 | 1 lb. .. | .. | 5 to 6 | |
| Celery .. .. | Domestic use .. .. | .. | Jan. to Mar. | .. | 4 0 | 0 6 | 4 oz. .. | .. | 5 to 6 | |
| Chocos .. .. | Market sale .. .. | July to Oct. | .. | .. | Trellis | 6 0 | .. | .. | 4 to 5 | |
| Cotton .. .. | Fibre .. .. .. | July to Oct. | Sept. to Oct. | Sept. to Oct. | 4 0 | 2 0 to 3 0 | 5 to 6 lb. .. | .. | 4 to 5 | |
| Cow Cane .. .. | Fodder .. .. .. | Oct. to May | Oct. to May | Oct. to Apr. | 5 0 | 2 0 | .. | 4,356 sets.. | 7 to 8 | |
| Cowpea .. .. | Fodder and green manure | Aug. to Jan. | Sept. to Jan. | Nov. to Feb. | 3 0 | .. | 10 lb. .. | 15 to 20 lb. | 4½ | |
| Cucumber .. .. | Market sale .. .. | Nearly all seasons | Nearly all seasons | .. | 5 0 | 2 0 | 1 lb. .. | .. | 3 | Where districts are free from frosts these can be planted all the year round. |
| Egg Plant .. .. | Domestic use .. .. | July to Oct. | .. | .. | 3 0 | 3 0 | 1 oz. for 1,000 plants | .. | 6 | |
| Garlic .. .. | Market sale .. .. | Mar. to May | Aug. to Sept. | .. | 1 6 | 0 6 | .. | .. | 6 | |
| Ginger .. .. | ditto .. .. | Aug. to Nov. | Oct. to Jan. | Oct. to Jan. | 3 0 | 1 0 to 1 6 | 5 to 6 cwt. | .. | 10 | |
| Grasses— | | | | | | | | | | |
| Elephant .. .. | Green fodder before the stems harden | Aug. to Oct. | Aug. to Oct. | .. | 5 0 | 2 6 | 3,432 cuttings of stem | .. | 4 to 5 | Can be cut at intervals during each season until unprofitable (also propagated from seed). |
| Panicum muticum | ditto .. .. | Aug. to Oct. | Aug. to Oct. | .. | 6 0 | 6 0 | Rootlets .. | .. | 4 to 5 | |
| Paspalum .. | Pasture.. .. .. | Early rains .. | Early rains .. | Early rains .. | .. | .. | .. | 8 to 10 lb. | | |
| Prairie .. .. | ditto .. .. | .. | Mar. to Apr. | .. | .. | .. | .. | 30 to 40 lb. | 4 to 5 | |
| Rhodes .. .. | ditto .. .. | Early rains .. | Early rains or mid wet season | Early rains .. | .. | .. | .. | 4 to 5 lb. .. | 4 to 6 | Sow in rainy season. |
| Herbs— | | | | | | | | | | |
| Lavender .. .. | Perfume .. .. | Mar. .. | Aug. to Sept. | .. | 4 0 | 2 0 | .. | .. | .. | Propagated from seed or by division of rootlets. |
| Marjoram .. | .. | .. | Aug. to Sept. | .. | 2 6 | 0 6 | .. | .. | .. | 3 months from rootlets. |
| Mint .. .. | .. | Aug. .. | Aug. to Sept. | .. | .. | .. | .. | .. | .. | |
| Sage .. .. | .. | .. | Aug. to Sept. | .. | 2 6 | 0 9 | .. | .. | .. | 3 months from rootlets.. |
| Thyme .. .. | .. | .. | Aug. to Sept. | .. | 2 6 | 0 6 | .. | .. | .. | 3 months from rootlets. |
| Kohl Rabi .. .. | Market sale .. .. | Mar. to Apr. | Feb. to Apr. | Feb. to Apr. | 2 6 | 1 6 | 2 lb. .. | .. | 4 to 5 | |
| Leek .. .. | Domestic use .. .. | .. | Feb. to Apr. | .. | 2 0 | 0 6 | 2 lb. .. | .. | .. | Suited only to the cooler districts of the North. |
| Lettuce .. .. | Market sale .. .. | .. | Mar. to Sept. | .. | 2 0 | 0 9 | ½ lb. .. | .. | 3 | |
| Linseed (Flax) .. | Grain .. .. .. | .. | Jan. to Feb. | .. | .. | .. | 30 lb. .. | .. | 5 | |
| Lucerne .. .. | Fodder .. .. | Mar. to Apr. | Feb. to Mar. | Feb. to Mar. | Drilled | .. | 12 to 14 lb. | 16 to 20 lb. | Perennial | |

## NORTHERN AND TABLELAND DISTRICTS—*continued.*

| Crop. | Purpose for which Grown. | When to Sow or Plant. Coastal Districts. | When to Sow or Plant. Tableland Districts. | When to Sow or Plant. Inland Districts. | How Sown or Planted. Distance Rows Apart. Ft. In. | How Sown or Planted. Distance between Plants. Ft. In. | How Sown or Planted. Quantity Seed per Acre if Drilled. | How Sown or Planted. Quantity Seed per Acre if Broadcasted. | Approximate Period of Growth of Crop in Months. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maize .. .. | Grain and silage .. | Aug. to Jan. | Nov. to Jan. | Nov. to Jan. | 4 0 | 1 6 | 8 to 10 lb. | .. | 4 to 5 | |
| Mangel and Sugar Beet | Stock food .. .. | .. | Feb. to Mar. | .. | 2 6 | 1 3 | 5 to 7 lb. .. | .. | 6 to 7 | |
| Marrow, Vegetable .. | Market sale .. .. | Sept. to Feb. | Nov. to Feb. | .. | 4 to 8 ft. | 3 0 | 2 lb. .. | .. | 3 to 4 | Distance apart and time of maturing according to variety. |
| Melon, Rock .. | ditto .. .. | Sept. to Feb. | Nov. to Feb. | .. | 4 to 6 ft. | 2 0 | 1 lb. .. | .. | 3 to 4 | Distance apart and time of maturing according to variety. |
| Melon, Water .. | ditto .. .. | Nov. to Feb. | Sept. to Dec. | Nov. to Dec. | 4 to 6 ft. | 2 0 | 2 lb. .. | .. | 3 to 4 | |
| Millet, Foxtail varieties, these include the so-called Giant Panicum | Fodder .. .. | Jan. to Mar. | Aug. to Jan. | .. | .. | .. | 10 to 14 lb. | .. | 2 | Should be cut for hay before the seed forms. |
| Millets, French .. | Grain .. .. .. | .. | Aug. to Feb. | .. | .. | .. | 8 to 10 lb. | .. | 1½ | |
| Oats .. .. | Green feed .. .. | .. | Mar. to June | Feb. to Mar. | .. | .. | 1½ bushel .. | 1½ to 2 bus. | 4 to 5 | |
| Onion .. .. | Market sale .. .. | Mar. to May | Mar. to May | Mar. to Apr. | 1 0 | .. | 4 lb. .. | .. | 5 to 6 | |
| Panicum (White) and Japanese Millet | Silage, hay, and green fodder | Mar. to May | Oct. to Mar. | Oct. to Mar. | .. | .. | 14 to 16 lb. | .. | 2 | |
| Parsley .. .. | Market sale .. .. | Mar. .. | Feb. .. | Feb. .. | 2 6 | .. | 1 lb. .. | .. | 2½ to 3½ | |
| Parsnip .. .. | ditto .. .. | Feb. to Apr. | Jan. to Apr. | Jan. to Apr. | 2 0 | 0 9 | 1 lb. .. | .. | 6 to 7 | |
| Pea, Field .. .. | Fodder .. .. | .. | Feb. to Apr. | Mar. to Apr. | 2 0 | .. | ½ to ¾ bus. | .. | 4 to 5 | Usually combined with a cereal fodder crop. |
| Pea, Garden .. .. | Market sale .. .. | Mar. to May | Feb. to June | Mar. to May | 2 0 | .. | 1½ bushel | .. | 4 | Period of maturing according to variety. |
| Peanut .. .. | ditto .. .. | Nov. to Mar. | Nov. to Feb. | Nov. to Feb. | 3 0 | 1 3 | 30 to 35 lb. | .. | 5 | |
| Potato .. .. | ditto .. .. | Mar. to May | {Oct. to Dec. Feb. to Mar. | Oct. to Dec. Feb. to Mar.} | 3 0 | 1 0 | 8 cwt. .. | .. | 3 to 4 | |
| Potato, Sweet .. | ditto .. .. | Aug. to Jan. | Oct. to Feb. | Oct. to Feb. | 3 to 3½ ft. | 1 6 | 9,000 cuttings | .. | 3 to 4 | |
| Pumpkin .. .. | Market sale and stock food | Mar. to Apr. and from Aug. to Nov. | Nov. to Feb. | Nov. to Feb. | 6 to 8 ft. | 3 to 4 ft. | 2 lb. .. | .. | 5 to 6 | Distance apart and period varies according to variety. |
| Radish .. .. | Market sale .. .. | Nearly all seasons | Nearly all seasons | Nearly all seasons | 1 0 | .. | 10 to 12 lb. | .. | 1½ | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Rape* .. .. | *Fodder and green manure* | *..* | *Mar. to May* | *..* | *..* | *..* | *5 to 6 lb. ..* | *..* | *4 to 5* | |
| Rhubarb .. .. | Market sale .. .. | Aug. to Sept. | Sept. to Nov. | Sept. to Nov. | 4 0 | 4 0 | 1½ lb. .. | .. | 4 to 5 | When propagated from roots quicker returns may be expected. |
| Rice, Upland .. | Grain .. .. .. | Sept. to Feb. | Oct. to Jan. | Oct. to Jan. | Drilled | .. | 12 to 16 lb. | 40 to 50 lb. | 4 to 6 | Harvest when half seed head is yellow. Stack and thresh after 6 weeks. |
| Rosella .. .. | Market sale .. .. | Sept. to Dec. | Oct. to Dec. | Oct. to Dec. | 3 to 4 ft. | 3 0 | .. | .. | 3 to 4 | |
| Rye .. .. | Fodder .. .. | .. | Mar. to June | Mar. to May | Drilled | .. | ¾ to 1 bus. | .. | 4 | |
| Shallot .. .. | Market sale .. .. | Nearly all seasons | Nearly all seasons | Nearly all seasons | 1 6 | 0 6 | .. | .. | 3 to 4 | |
| Sorghum, Feed .. | Fodder and silage .. | Nov. to May | Nov. to Mar. | Nov. to Feb. | 3 6 | 0 8 | 4 to 5 lb. .. | .. | 3 to 4 | |
| Sorghum, Grain .. | Grain .. .. .. | Nov. to May | Nov. to Mar. | Nov. to Feb. | 3 6 | 0 8 | 3 to 4 lb. .. | .. | 4 | |
| Soudan Grass .. | Hay or silage .. .. | Early rains .. | Early rains .. | Early rains .. | 2 6 | .. | 3 to 4 lb. .. | .. | 2 | |
| Soy Beans .. .. | Grain .. .. .. | Aug. .. | Sept. to Jan. | Sept. to Jan. | 2 6 | 0 8 | 10 lb. .. | .. | 3 | |
| Swede .. .. | Market sale .. .. | Mar. to May | Feb. to May | Feb. to Apr. | 2 0 | 1 0 | 2 to 3 lb. .. | .. | 4 to 5 | |
| Sweet Corn .. .. | ditto .. .. | Aug. to Jan. | Nov. to Jan. | Nov. to Jan. | 3 6 | 1 0 | 8 to 10 lb. | .. | 3 | |
| Tares .. .. | Fodder or green manure | Same as Field | Peas. | .. | .. | .. | 1¼ bushel .. | ½ bushel with 1 bushel of other grain | 4 | For fodder purposes it is best sown with some other form of cereal. |
| Tobacco .. .. | Leaf .. .. .. | Oct. to Jan. | Oct. to Feb. | Oct. to Jan. | 4 0 | 1 ft. 8 in. to 2 ft. | 1 oz. in seed bed | .. | 3 to 4 | Seeds must be sown in specially prepared seed beds and transplanted. |
| Tomato .. .. | Market sale .. .. | Feb. to May | Nov. to July | Nov. to July | 4 0 | 2 0 | ¼ lb. .. | .. | 3 to 4 | |
| Turnip, Garden .. | ditto .. .. | .. | Feb. to May | .. | 2 0 | 0 6 | 2 lb. .. | .. | 2 to 3 | |
| Wheat .. .. | Hay, or green fodder.. | .. | Feb. to June | Mar. to May | Drilled | .. | 40 to 60 lb. | .. | 4 to 5 | Fodder purposes only. |

# Answers to Correspondents.

### Elephant Grass.

E.A.R. (Tamaree)—

The specimen is the Elephant Grass or Napier's Fodder, *Pennisetum purpureum*, cultivated in coastal Queensland and northern New South Wales as a fodder. It is readily propagated from seed, or by cuttings or divisions. Stock are very fond of it, but it is probably best fed chaffed or cut, but sometimes it is grazed over, particularly after a cutting, and is not known to possess any poisonous or harmful properties at any stage of its growth.

### Stagger Weed.

G.B.S. (Eumundi)—

The specimen is *Stachys arvensis*, Stagger Weed, also commonly known as Wild Mint, but not to be confused with the weed responsible for the loss of travelling stock in the Pittsworth district about twelve or eighteen months ago. The present plant causes "shivers" or "staggers" in working horses and travelling stock, but ordinary paddock stock, such as dairy cows, calves, &c., apparently are unaffected by it, the animals having to be excited or driven to cause the symptoms to appear. As a matter of fact, dairymen generally regard the plant as quite a useful fodder. It is a very common winter weed in Queensland, and I should think that your suggestion of continual ploughing should eradicate it next year.

### Quinine Tree.

"INQUIRER" (Brisbane)—

So far as we know the common Cinchona or Quinine tree is not growing at the present time in Queensland. Its cultivation, however, has recently been strongly recommended, and the Department of Agriculture and Stock is making inquiries. Until about 1880 the forests of Colombia, Equador, Peru, and Bolivia furnished most of the bark used in the production of Quinine. Now practically the whole supply is obtained from plantations in Java, India, Ceylon, and Madagascar.

The two species most commonly grown are *Cinchona ledgeriana* (Yellow Bark) and *C. succirubra* (Red Bark), but recently the Dutch in Java have made some very promising crosses. At one time the bark was shipped to Europe for the manufacture of quinine, but now the finished product is manufactured at or near the plantations. The cultivation, preparation of the bark, and manufacture are very technical processes, and it is rather difficult on this occount to say that it would ever become a small man's industry.

### Grass Tree.

F.G.M.—

The Grass Tree has been accused of poisoning stock on different occasions. In the swampy country between Brisbane and Gympie it has been stated that cattle eat the young flowering poles greedily and become affected with "staggers" in the same way as in "zamia" poisoning. Feeding tests, however, have always given negative results, and we are of opinion that it is more the class of country on which the stock are run than the Grass Tree itself which is the cause of the trouble. On better class, ridgy country, where stock eat Grass Tree very freely during dry periods, it is looked on—particularly the young flowering poles—as quite good fodder.

### Green Manuring in Banana Groves.

J.D.B. (Buderim Mountain)—

Your request for an opinion as to whether the practice of growing "mulch beans" between banana rows with the idea of preventing soil erosion as well as providing humus and choking weed growth affects the principal crop is answered by the Fruit Branch as follows:—

"Green manurial crops, such as those mentioned, if not grown too close to the banana stools, are not likely to seriously retard the growth of the latter, and the practice is recommended. Sowings made about November and December will give advantages which far outweigh the slight influence the green crop is likely to have in retarding the growth of bananas."

**Washing Soda Not a Fertilizer.**

NEWCOMER (Ingham—

The Agricultural Chemist, Mr. E. H. Gurney, advises—Washing soda is sodium carbonate, containing water of crystallisation. Sodium carbonate is not a fertilizer, and should not be added to the soil, as in certain concentration it ruins the texture of the soil, causing it to puddle in wet weather and dry to a hard cement-like mass in dry weather. Further, sodium carbonate, when present in the soil to any extent, prevents plant growth.

**Banana Growing at Bundaberg.**

W. J. McC. (Townsville)—

Relative to your inquiry as to the suitability of dense wattle scrubland, with good though rather sandy soil, situated near Bundaberg, for banana-growing, it is suggested that your correspondent seek the advice of the Banana Board inspector in the Bundaberg district and whose headquarters are at Maryborough. He, no doubt, is well acquainted with the locality in which your correspondent proposes to plant the suckers she has asked you to supply.

**Pig Research.**

L.P.A. (Murgon)—

The Senior Instructor in Pig Raising (Mr. E. J, Shelton) advises:—

The finance required to cover erection of piggeries at the Animal Health Station has been provided by an organisation not directly associated with the Department, so that these funds will not be a call on the money provided by Parliament.

The piggeries erected at Gatton College for experiment purposes are still being used for that purpose, and a number of feeding tests, in which cotton-seed meal provided by the Cotton Board is being used, are providing very useful information, which will, in due course, be made available through the Cotton Board.

It is planned to carry out a variety of feeding trials at Yeerongpilly and to utilise meat meal as a substitute for skim milk, and also other concentrates in the feeding of pigs, with a view to supplementing the data on the use both of commercial foodstuffs and farm-grown crops in the production of pigs for the export trade.

Already preparation has been made for research work in the control of parasitic life in pigs, and, in this connection, it may interest the members of your Local Producers' Association to note that the work carried out along these lines by this Department has created widespread interest. The pig improvement scheme is a form of financial assistance for the purchase of better boars and sows, aiming at fostering the production of pigs for the export trade.

It is suggested that your secretary get in touch with Mr. J. A. Heading, of Murgon, a member of the Queensland Pig Industry Council, who would be able to give members much information relative to the work of the Pig Council and of the various schemes at present receiving attention in the interests of pig-raisers.

**A Tropical Weed (*Gomphrena decumbens*).**

O.L.H. (Mareeba)—

The specimen is *Gomphrena decumbens*, a common tropical weed of the Amaranth family. It is said to have first made its appearance in Queensland about Townsville some two or three years ago, when it came up where circus elephants had been feeding. It has now become very widely spread in the State, as we have seen it growing as far west as Torrens Creek and as far south as Brisbane. We have not heard a common name applied to it, but it belongs to a genus of plants some of the members of which are commonly referred to as Bachelor's Buttons. The plant should make quite a good fodder, and, though we have had no personal experience, we think stock would take to it readily enough.

**Finger Cherry—A Dreaded Plant.**

E.C.D. (Townsville)—

The specimen sent you from El Arish represents the Finger Cherry, *Rhodomyrtus macrocarpa.* As you know, this is one of the most dreaded plants in North Queensland, the fruit, if eaten in quantity, commonly causing permanent blindness.

**Care of the Boar.**

W.M., Degilbo.—

The Senior Instructor in Pig Raising advises.—With regard to the Berkshire boar, generally speaking we do not advocate the use of drugs or other artificial means of stimulation, for if the type of pig, the feeding and management is at fault, drugs will prove useless and expensive, and in any case their effect is usually only of a temporary nature. Such artificial stimulants do not enjoy a ready sale in the stock world in this country. It is advisable to keep the boar in a separate paddock from the sows and to allow them to run with him immediately after weaning and until they have had good opportunity for service. It is advisable to strictly limit the food of the boar in particular during this period (following flushing, if that has been practised), otherwise the boar may become too fat and lazy, and the sow may have so much feed that she cares for nothing else. It sometimes pays to run another boar in an adjoining yard (a good strong picket fence of course being necessary as subdivision fence), and in your case I would think this would be advisable, seeing that you intend running a number of sows.

It usually happens that comparatively thin boars and sows breed more freely than fat or heavily fed animals; hence strict control of food supply is essential. In your case, we would suggest the best plan would probably be to allow the boar to run with the sows for a month or two to compel him to take additional exercise and share food with the sows. In this way, if he is likely to breed at all, he would be encouraged so to do; overfeeding has apparently affected his genitive capacity, and until condition is severely reduced, he is not likely to prove productive; and probably while this is being done, another more active boar would have sired a dozen or more litters, and be in first-rate breeding condition. It is useless carrying stock that will not breed. In this regard, perhaps, the Berkshire breed has suffered more than any other from forcing for show purposes; in fact, some strains are practically useless. Our general advice would be to dispose of slow breeders and introduce more active strains and push on with a fresh breeding policy. In this direction the Department is willing to help you through the Pig Improvement Scheme.

# General Notes.

**Citrus Industry.**

Referring to the citrus industry in Queensland, the Minister for Agriculture and Stock, Mr. F. W. Bulcock, M.L.A., stated recently that the production of fruit was at present equal to about 75 per cent. of the consumption, and we were fast approaching the stage when it would be necessary to find extra markets for a surplus.

In order to avoid the undesirable position which existed in other States and in various parts of the world, where there was a big production of common oranges not up to export quality, it was his intention to set up a standard of the best varieties of oranges, mandarins, grape fruit, and lemons, and the intending planters of citrus trees would be recommended to make a selection of these varieties. In order further to ensure that only the best trees were supplied by nurserymen to intending planters, a scheme initiated by Mr. H. Barnes, Acting Director of Fruit Culture, for the supply to nurserymen of citrus budwood selected under Departmental supervision from special trees displaying desirable characteristics of vigour, freedom from disease, and productivity of fruit true to type, was well in hand.

''It was very evident,'' added the Minister, ''after a survey of the orchards in some districts, that in the past some nurserymen had not been too scrupulous in regard to the selection of budwood, and the result could be seen in the weak condition of many trees and their shy bearing habit, when they should be producing on an average four to eight cases per tree.''

The Department had established, some time ago, a citrus budwood plot planted with trees worked with the very best of budwood, but, as it would necessarily be several years before the trees would be large enough to supply all the budwood required, in the meantime the best trees that could be found had been selected from which to obtain budwood.

Another matter which was receiving consideration was that of seed selection for the growing of stocks. At present some nurserymen selected their seed from the most convenient sources. It was realised that this method often resulted in weak stocks incapable of producing a root system of sufficient strength to support a good tree. A search was being made by officers of the Department for vigorous-growing seedling trees of both orange and rough lemon which were recognised as bearing the most suitable seed for the growing of stocks.

## Staff Changes and Appointments.

Messrs. J. D. Hynes, of Mingoola, and K. V. Doherty, of Maryvale, have been appointed Acting Inspectors of Stock.

Sergeant C. W. Watson, Stanthorpe, and Constable A. C. J. Arndt, Tinana, have been appointed also Inspectors under the Slaughtering Act.

Messrs. H. C. Stubbs, E. E. Jensen, C. G. Chick, and G. Tulloch, banana-growers in the Lower Tallebudgera Creek area, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Messrs. V. G. Tredwell, J. J. Turner, J. E. Dolan, E. N. Greaves, and J. J. Tracey, banana-growers in the Upper Currumbin area, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. E. R. Ashburn, who previously held the position of manager of the State Farm at Gindie, has been appointed Instructor in Agriculture, Department of Agriculture and Stock.

## The Council of Agriculture.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts declaring that the number of members of the Council of Agriculture shall be twenty-seven.

The Acts provide that the Council shall consist of the Director of Marketing, representatives of Commodity Boards, the Committee of Direction of Fruit Marketing, and the State Wheat Board, also one representative for each of the nine districts embracing Local Producers' Associations.

Regulations have been approved which prescribe the nine districts which embrace Local Producers' Associations. Briefly, these are Central Queensland, the Burnett, South Burnett, Wide Bay, East Moreton, West Moreton, the Darling Downs, the Western Downs, and the Atherton Tableland. The Regulations also empower the Governor in Council to appoint one representative for each of the districts mentioned.

Provision is also made for the appointment, at the annual meeting of the Council of Agriculture, of an Executive Committee consisting of not more than ten members. The Committee shall include the President, Vice-President, Director of Marketing, two representatives of the Butter Board, and two representatives selected by and from amongst all representatives of the Council with the exception of the district representatives, and three representatives selected from amongst the nine district representatives. Such Executive Committee shall hold office until the next annual meeting of the Council, and any vacancy which may arise therein on account of the death or resignation of any member other than the President, Vice-President, or Director of Marketing, may be filled by the Council by the appointment of some person selected in the same manner as the person dying or resigning was selected. The Council may delegate to the Executive Committee such powers by resolution as seem to the Council to be desirable.

A special Regulation has been issued prescribing the members of Commodity Boards who shall be members of the Council, and these include two representatives of the Butter Board (J. McRobert, of Maryborough, and W. J. Sloan, of Malanda), one representative of each of the remaining Boards (H. T. Anderson, Biddeston—Cheese Board; J. Beck, Stanwell—Cotton Board; W. Bailey, Atherton—Atherton Maize Board; C. Brumm, Woongoolba—Arrowroot Board; N. J. Christiansen, Wooroolin—Peanut Board; C. W. Edwards, Kingston—Honey Board; H. Kessler, Cambooya—Barley Board; A. McLauchlan, Boonah—Egg Board; H. Niemeyer, Hatton Vale—Broom Millet Board; G. D. O'Neill, Allora—Canary Seed Board; H. T. Skennar, Malanda—Northern Pig Board; W. Ranger, Brisbane—The Committee of Direction of Fruit Marketing; G. Johnson, Mackay—The Queensland Cane Growers' Council; and W. J. Brimblecombe, Pirrinuan—Wheat Board).

The above members are those who have been previously elected by the respective Commodity Boards, and shall be members of the Council of Agriculture pending the election of members of Commodity Boards to be members of the Council, as provided by the Acts.

The Governor in Council has appointed the following representatives of Districts Nos. 1 to 9, embracing Local Producers' Associations, to be members of the Council of Agriculture:—

| | District. |
|---|---|
| J. E. Harding (Dalma Scrub) .. | No. 1, Central Queensland |
| V. Baker (Gayndah) .. .. .. | No. 2, The Burnett |
| W. L. Osborne (Wondai) .. .. | No. 3, South Burnett |
| E. Brabiner (Green's Creek, Gympie) | No. 4, Wide Bay |
| C. Bateman (Woodford) .. .. | No. 5, East Moreton |
| W. A. Fielding (Blenheim) .. .. | No. 6, West Moreton |
| J. Buckley (Rose Hill) .. .. | No. 7, Darling Downs |
| W. E. Ashford (Hannaford) .. | No. 8, Western Downs |
| J. Gargan (Atherton) .. .. | No. 9, Atherton Tableland |

**Cheese Board.**

The Order in Council governing the election of members to the Queensland Cheese Board has been amended so as to conform with changes of ownership that have taken place in the various cheese factories operating throughout the State.

In the past, under "*The Regulation of Sugar Cane Prices Acts, 1915 to 1931,*" members of Local Sugar Cane Prices Boards have been removed from office at the time when nominations for a new Board close. This meant that there was no Local Board operating from about the end of January until the gazettal of the new Board in April. A Regulation under the abovenamed Acts has now been passed whereby it is provided that members of each Local Board, other than the chairman, shall vacate office on the day preceding the date fixed for the taking of the poll for the election of the next succeeding Local Board.

**Mange Cure for Dogs.**

We are frequently appealed to for a remedy for dogs affected with mange. We recommend the following, which we have found very effective in almost every case where it has been applied in time. Don't wait until the dog is hopelessly affected become commencing treatment.

Wash affected parts with soft soap and warm water an hour before applying.

Apply 1 dr. creosote. 1 dr. liquor of potassa, 12 dr. olive oil. Repeat twice weekly.

**Cheese Board.**

The following nominations have been received at the Department of Agriculture and Stock in connection with the election of five growers' representatives on the Cheese Board for a term of one year:—Divisions 1, 2, and 3: Thomas Dare, Narko, Henry T. Anderson, Biddeston, and Alfred J. Harvey, Pittsworth, all returned unopposed. In Division 4 Mr. David G. O'Shea, the present member, is opposed by Mr. A. G. Tilley, of Rosenthal, Warwick, and voting-papers will be sent to the suppliers concerned within the next few days. Mr. Arthur Pearce, Coalstoun Lakes, has been returned unopposed for Division 5.

As 10 per cent. of the suppliers did not petition for a poll, the operations of the board will be continued for a further term of one year as from the 1st August.

**Stock Disease Remedies—Warning to Stockowners.**

In a statement which has been issued by the New South Wales Minister for Agriculture, a note of warning is sounded, in the interests of stockowners throughout that State, with regard to the action of vendors of certain proprietary remedies for different stock diseases. The statement is of equal interest to Queensland stockowners.

In connection with vaginitis it is pointed out that in a notice which recently appeared in a country newspaper over the name of a representative of a company handling a certain specific for the treatment of this disease, it was, in effect, claimed that vaginitis was the cause of sterility and abortion in cows, and an offer was made to inspect herds gratuitously and explain the disease to stockowners. While this disease does lead to temporary sterility, it is pointed out by the Chief Veterinary

Surgeon of the New South Wales Department that all available evidence is opposed to the theory that vaginitis is the cause of abortion, and the observations of competent and reliable investigators in Europe and Great Britain confirm the departmental viewpoint in this regard. In view of the inaccuracy, according to present scientific knowledge, of the opinion expressed in the notice referred to, farmers will readily be able to assess for themselves the value of any explanation that might be offered in regard to this disease by the person concerned.

Instances have come under notice, the Minister explains, where, although a preparation may contain constituents which it is recognised are beneficial for the treatment of a certain disease, the price charged is altogether disproportionately high in comparison with the actual cost of the constituents. In one such case a preparation was reported to be selling at over £2 for a tin containing less than a pound of the mixture, whereas the cost of the constituents would probably amount to less than 1s. per lb.

Other instances have come under notice where farmers' herds have been inspected, and treatment recommended for vaginitis, by persons who it is believed have had little or no training in connection with diseases of stock. In one case, cows were examined by means of an instrument, and it is understood that no precaution was taken to sterilise the instrument before using it on each individual animal, with the result that a grave risk was run of spreading any disease that might possibly have been present. Another objectionable practice which has been reported is that of vendors of specifics of this nature, after inspecting the stock and diagnosing the trouble according to their own viewpoint, endeavouring to induce the stockowner to accept the treatment they are canvassing, by forwarding the material or leaving it with the stockowner despite protests from the latter.

The Minister advises stockowners to be on the alert so as to avoid being imposed upon by unscrupulous individuals in connection with the treatment of stock diseases, and he urges that before allowing persons of whom they have no knowledge to conduct examinations of their cattle, farmers should be particularly careful to satisfy themselves that these individuals possess the proper qualifications which would enable them to take precautions against the spreading of infection. In conclusion, he states that, in accordance with a resolution adopted at the conference of Ministers of Agriculture recently held in Sydney, draft legislation is being prepared, for consideration, to regulate the sale of stock medicines, vaccines, stock licks, and patent stock foods.—A. and P. Notes, N.S.W. Department of Agriculture.

## Soil Erosion in Dairying Districts—Prevention by Contour Draining.

Soil erosion was causing the loss of considerable areas of good lands in New South Wales, said the Senior Experimentalist of the New South Wales Department of Agriculture in the course of a recent address to South Coast dairy farmers, and as an indication of the enormous damage that might be done if preventive measures were not adopted instanced the total loss in America of 30,000,000 acres of their best lands and the partial loss of another 60,000,000 to 70,000,000 acres.

The far South Coast was subject to erosion, as it was largely of a hilly nature, and a good deal of cultivation was undertaken on this hill country. Once the surface soil was washed away the damage could not be repaired, and although the signs of erosion might not yet appear to be very serious, now was the time to commence the work of putting in contour banks to prevent development of the trouble. The banks, it was explained, had a fall of 6 to 9 inches in every 100 feet, and conveyed the run-off water across the slopes and allowed it to be disposed of wherever convenient. It was surprising, said the speaker, how, after contour draining, much of the water soaked in instead of running off as previously. This was an added advantage. For detailed directions concerning the method of marking out and constructing the banks, reference should be made to the free leaflet on the subject obtainable from the Department.

Rocks, timber, and other obstructions were likely to hamper operations on coastal lands, but farmers should not be discouraged by such difficulties, nor should any farmer imagine that his particular farm was too steep or the slopes too complicated to treat in the manner suggested. The only cases that presented real difficulties were those where steep land higher up (perhaps owned by another farmer) caused a run-off that washed the land lower down the slope.

In timber-strewn and rocky country, a single furrow on the contour line would suffice in many cases. In any case, as the contour banks on grazing country had not to be crossed by cultivating machinery, there was no necessity to build them quite so wide or high as on cropping land, for once they were constructed and grassed over, the crown of the bank was never again seriously disturbed, and consequently very little maintenance was required, it being only necessary to prevent rubbish blocking up the drain on the top side. Moreover, as only small banks were needed on grazing country, they could with advantage be placed closer together.

## Oil-engine Fumes cause Second-grade Cream.

Where oil engines are installed on the dairy farm there is always a danger of the milk or cream becoming adversely affected by absorbed odours. Kerosene or crude oil engines are worse in this respect than benzine engines, but it is only a degree of taint that divides one from the other. Faults arising from absorbed oil or benzine fumes are a frequent cause of second-grade cream.

For this reason all oil or benzine engines must be installed apart from where the milk vat and separator are situated. Exhaust fumes from engines must, in all cases, be carried away from the buildings in order that the prevailing winds do not blow them back through ventilators or other openings into the separator room. Care must be taken where the water from the roof of the dairy premises is conserved that the exhaust does not blow on to the roof, or the water will be tainted.

## Banana By-Products and Dehydrated Vegetables.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) stated recently that from time to time inquiries are made regarding the potentialities of markets overseas for banana by-products and dehydrated vegetables. Cables had been sent to the Agent-General for Queensland in London, with a view to ascertaining the demand in other countries, and he had received advice which indicated that there did not appear to be a prospect of any remunerative business in the lines mentioned, except, perhaps, with Germany.

There was practically no demand in the United Kingdom, stated Mr. Bulcock, for either banana flour or dried vegetables. Adequate supplies of fresh vegetables were available, and naturally people preferred the fresh article. Consignments had been received periodically from Holland and elsewhere, but sales proved very unsatisfactory. Small quantities were sold for use on tramp and cargo vessels and for export to tropical countries. Banana chips in moderate quantities were purchased at ruling continent prices of £8 to £9 per ton, subject to arrival in good condition.

If Queensland manufacturers consider they could compete at this figure, it would be advisable, first of all, to submit samples for comparison of quality with that of other countries.

The demand for banana flour in France was limited, and there was no immediate prospect of an expansion. Large stocks were on hand at various parts, and the agents were unable at the present moment to dispose of them. Australia had no trade agreement with France, and therefore any of our goods and products were subject to the French general tariff. It would, therefore, be difficult to compete with importers of banana flour from the French colonies. Dried vegetables were unknown on the French market, and it would therefore be necessary to submit samples, together with the best prices and quantities offered. The most important manufacturer of powdered soups in France bought up all the fresh vegetables necessary direct from the growers at very low cost, and if dried vegetables were offered they would have to be quoted at a very low price.

Germany appears to offer a possible market for banana chips for the manufacture of flour. The duty on the flour itself renders import prohibitive. In 1932 Germany imported 113,000 tons of dried bananas, which were consumed by the German milling industry in the production of banana flour. There has, however, been latterly a big decline in the price of banana chips, the present price being 50 phennige (6d.) per kilogramme (2 lb.). The chief use for banana flour is in the form of banana cocoa, and it is stated to be used extensively in the manufacture of cocoa and in the preparation of foodstuffs and of patent foods for children. A certain amount of business is done with dried vegetables, but in this case also it would be necessary to submit samples and the best possible prices before making any shipments.

## Young Farmers' Club.

The success attending the formation of pig, calf, and other clubs in Australia, and particularly in New South Wales and Queensland, is but another evidence of the popularity of this movement throughout the world. Writing a few weeks ago, the Secretary of the National Federation of Young Farmers' Clubs in England, in extending season's greetings to Australian club members, advised that they were very gratified to receive the good wishes of members in this country which had been conveyed by the writer of these notes. British club members look forward to the day when these good wishes may be exchanged personally between representative teams of Australian and British members. Club members in New Zealand had also expressed the hope of a closer relationship between members in the other dominions, the Commonwealth, and the Homeland.

The conditions under which members work vary considerably in different countries, but all have the same object in view. The movement in England is making steady progress, proved by the fact that, in the last year, the total number of clubs has increased by 50 per cent.; a remarkable feature has been the greatly increased number of agricultural show societies, which have offered facilities to young farmers' clubs, either to show their stock or to enter stock judging competitions in which American and Canadian club members co-operate wholeheartedly, and send selected teams to Great Britain each year. Such events have aroused considerable interest and very favourable comment on the quality of the stock shown and on the practical capabilities of the young judges.

Is it too much to hope that an Empire Competition may be inaugurated or that one day Australia will send a team to the Young Farmers' International Judging Competitions at the Royal Show in England An exchange of visits on these lines would be something which those participating would remember all their lives. In these days of Empire travel it should not be impossible to arrange.

In conclusion, the Federation of Young Farmers in Great Britain desired to convey to overseas kinsmen and kinswomen a message of friendship, and to express the hope that members may always work towards a closer co-operation.

## Tobacco Export Trade.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock, M.L.A.) is in receipt of a report from the Acting Agent-General for Queensland (Mr. L. H. Pike) on two small consignments of tobacco leaf shipped to England in November last by the Department of Agriculture and the Mareeba Chamber of Commerce respectively. The primary object of the despatch of these consignments, which were representative of flue-cured tobacco leaf produced in Central and Northern Queensland, was to ascertain the prospects of securing an export market in the United Kingdom for Queensland tobacco.

In all samples examined and analysed, the leaf showed good combustion, but the flavour, although mild, was not satisfactory in the opinion of the manufacturers. The chemical examination and smoking trials indicated that the districts in which the leaf was grown were suitable for the cultivation of the type of tobacco examined, and the coarseness observed on smoking could probably be obviated by more satisfactory curing. Probably all the tobacco represented by the samples could be used for blending purposes in cigarette manufacture, but the report suggested that an article made entirely of the leaf would probably not appeal to the public taste. It was suggested that further quantities of tobacco, or, if possible, trial bales, might be forwarded to London to test the market, as the judgment pronounced on such small samples as those despatched could not be taken as final.

The Acting Agent-General supplied the rates of duty on unmanufactured tobacco in the United Kingdom, as follows:—

| | Full. Per. lb. | Preferential. Per lb. |
|---|---|---|
| If unstripped— | s. d. | d. |
| Containing 10 lb. or more of moisture in every 100 lb. weight .. .. .. .. .. .. .. | 9 6 | 7.5½ |
| Containing less than 10 lb. of moisture in every 100 lb. weight .. .. .. .. .. .. .. | 10 6 | 8.2⅞ |

He pointed out that duties on stripped unmanufactured tobacco were practically the same, and thus gave a preference on Empire tobacco of higher moisture content of 2s. 0½d. per lb. He also pointed out that, by virtue of the agreement entered into at the Ottawa Conference, between the Governments of the United Kingdom and Southern Rhodesia, the above rates of preferential duties were secured for a period of ten years from the date of the agreement on 20th August, 1932. It was important to note that the preferential margin of duty does not benefit the Empire grower, otherwise than by enabling him more readily to secure a market in the United Kingdom. In effect, the tobacco manufacturer pays a lower price for Empire tobacco and passes on to the consumer a large part of the preference, thus enabling the Empire products to be sold at the lowest retail prices in Great Britain. It is conceivable that, had the tobacco manufacturer been forced to pass on the full amount of the preference to the grower, the market for Empire tobaccos in the United Kingdom would have been considerably restricted, as the American competition would have kept the Empire growers off the market to a very large extent.

To illustrate this more clearly, Southern Rhodesian leaf of bright Virginian type is being sold in the United Kingdom at prices ranging from 10d. to 1s. 6d. per lb. The manufacturer pays the duty, and, in effect, passes the whole of the preferential margin (say, 2s. 0½d. per lb.) or a large part of it on to the consumer, who buys Rhodesian tobacco in retail at from 7½d. to 1s. per ounce.

The consumption of Rhodesian tobacco in the United Kingdom increased by over 500 per cent. since 1926, and at present there are on the British market 270 pipe tobaccos and 85 brands of cigarettes, composed wholly or partially of Rhodesian leaf. These results have been achieved by the close study of special requirements of each market, and the supply of requisite types and qualities.

Although there are no immediate prospects of a satisfactory overseas market for our tobacco, the Acting Agent-General suggests that marketing conditions in the United Kingdom should be closely noted, so that at some future date full advantage might be taken of the knowledge and information gained when it is necessary to find an export market for surplus stocks of tobacco produced in Australia. This suggestion, said Mr. Bulcock, would receive the earnest attention of the Government.

**Tully Canegrowers' Executive.**

An amendment of the Queensland Cane Growers' Council Regulations of 1931 has been approved under the Primary Producers' Organisation and Marketing Acts. This provides for the deletion of such words as relate to the fees, allowances, and travelling expenses of the Tully River Central Mill Suppliers' Committee, and adds to the regulation containing the fees and expenses of District Cane Growers' Executives, particulars relative to such fees of the Tully River Central District Executive. The Tully River District Cane Growers' Executive was recently created by Order in Council.

**The Red-backed Spider.**

A wrong impression that the bite of a red-backed spider is "usually fatal when the venom was injected through a tender part of the skin" was corrected recently by the Director of the Queensland Museum (Mr. H. A. Longman), who has done great service to the community in accurately describing the insect and its characteristics in non-technical language. In response to a request from the "Brisbane Courier," Mr. Longman recently wrote:—

"This spider is found throughout Australia, New Zealand, the South Pacific Islands, India, Malaysia, Papua, and Eastern Arabia. It is locally known as the red-back, red-spot, red-striped, or jockey spider, and in New Zealand it is called the 'Katipo.' Its most distinctive feature is the red or orange strip running centrally down the upper surface of the abdomen, which is otherwise black. The oval body of this spider is distinctly smaller than a green pea, so the species is not a large one. It builds its web in dark corners, in old cans, among rubbish, or under sheltered stones. It has often been reported as haunting earth outhouses. There are a few cases of fatal consequences on record, however, and this spider is evidently our most notorious species. In the majority of cases of severe illness human beings were bitten when in outhouses. Medical aid should be obtained at the earliest opportunity. Female spiders may be sometimes seen with their globular case of eggs, and obviously these should be destroyed whenever possible."

*The Symptoms.*

Mr. Longman drew attention to an important article on the venom of the red-backed spider by Dr. C. H. Kellaway, M.C., M.D., M.S., F.R.C.P., of the Walter and Eliza Hall Institute, Melbourne, which appeared in the Medical Journal of Australia. Describing the symptoms, Dr. Kellaway wrote:—"There is a rapid onset of acute pain commencing in the bitten part, and extending to the limbs and body, associated with acute sweating. There is weakness, numbness, and sometimes paralysis of the limbs. Tremor is frequent. Delirium and restlessness may be present. The cold, clammy sweat, pallor, faintness, and nausea indicate a profound effect on the vaso-motor system. The acute illness lasts from one to three days, and is not fatal in adults. Convalescence is slow, and various skin rashes may appear during its course."

# Rural Topics.

### Herd-recording and Yield Improvement.

Every farmer who has submitted his herd for recording under the scheme administered by the Dairy Branch of the Department of Agriculture and Stock should appreciate fully the possibilities of the scheme. This idea is well backed by dairy experts below the Border, as is evident in an article in the current "Agricultural Gazette of New South Wales." It is considered that several failures to establish considerable increases in the herd production have been mainly due to insufficient understanding of the methods to be adopted in applying the results, and also to insufficient information having been recorded as to the breeding of the heifers that are being added to the herd from time to time.

It is wise, the writers point out, to record the details and the results of all the operations on the dairy farm. It is suggested that the first essential is the keeping of a permanent herd register. This should consist of a strongly-bound, small book, and all the foundation cows—i.e., those in the herd at the commencement of the compilation of the herd register, should be entered and allotted a number. Any new cow or heifer added to the herd will be allotted the next consecutive number. For instance, in an initial herd of forty cows, the foundation cows will be numbered 1 to 40. When a newly-calved heifer is added to the milking herd, she will be allotted number 41, and each subsequent addition will be allotted the next consecutive number until 999 is reached, when the numbers might be commenced again from one.

This identification number should be indelibly marked on the cow either with a tattoo outfit or with firebrands. In the case of a tattoo it is suggested that the number be placed in the left ear, whilst in the case of the use of firebrands, the number might be placed on the milking-side shoulder, the hair being clipped from around the part where it is intended to brand so as to ensure a clean, neat brand. Only when a cow or heifer has been added to the milking herd should the branding be carried out.

In this register should be kept particulars of the breeding of each cow entered, also any known particulars as regards the production of the dam, grand-dam, &c. The book should be large enough to enable entries to be made in it for a number of years.

The next requirement is the compilation of an annual register, and for this purpose a small cheap exercise book should be purchased. In this book should be kept a complete record of the monthly activities of each cow in the herd. The amount of milk, percentage of butter-fat, and the amount of butter-fat produced by each cow for the month, together with notes on the seasonal conditions, dates of service and by which bull served, date of calving, age of cow at the commencement of recording, sex of calf, name or number allotted to calf and details as to the final disposal of calf—i.e., whether kept for the purpose of later admitting to the milking herd or whether summarily disposed of—should all be recorded on a separate page for each cow. This book will be found to be a valuable adjunct to systematic dairying, since it will enable the farmer, at a moment's glance, to be fully aware of any particulars in regard to any cow in the herd.

### Trees on the Farm.

Those who have given some attention this winter to farm improvement by tree planting are reminded that if their enterprise is to be properly rewarded the young trees must be protected from injury, and given a degree of assistance in their development.

The chief danger threatening young trees on the farm and pastoral area is damage by stock, and it is useless making plantings unless the whole of the area is effectively fenced off from animal invasion. Stock not only destroy or injure young plants, but by trampling and packing the soil nullify the effect of preparatory cultivation. The fence should be stock-proof, and either permanent in character or sufficiently well constructed to keep out stock until the trees are beyond the reach of the largest animals. As the trees grow older stock can be admitted from time to time with advantage, as they serve to destroy weed growth and lessen the danger of fire by removing surface litter. A permanent fence with a properly constructed gateway permits the regulation of such entry. Where it is only intended to protect the trees until sufficiently well grown to be proof against stock damage, a barbed wire fence is very effective.

Where single shade or ornamental trees are planted out they should be protected by some form of tree guard. Protecting fences or tree guards should be provided for before the young trees are planted out.

It may be imagined that an ordinary ground fire running through an area of well developed trees would do little harm, but such fires are often hot enough to scorch and kill the living cambium layer just beneath the bark and outer wood, without the tree showing very evident injury. This results in cessation of growth in that portion, and commencement of decay, such fires being often the cause of many trees being rotten at the base. Fire scars are also formed which deepen with every burn, eventually undermining the tree and paving the way for the entrance of timber-destroying fungi and insects. The surface roots of trees are injured and valuable humus burnt out. Any young growth is destroyed.

The area under trees should be cultivated two or three times a year, especially for the first two or three years, in order to keep down weeds, prevent undue evaporation of moisture, and maintain good soil conditions. Weed growth in the early stages is particularly injurious, as it tends to suppress or completely destroy young tree growth, especially of the slower growing species. Weeds, moreover, increase the danger from fire, and reduce the available moisture supply. Under certain conditions, however, weed growth is of value in providing shelter for trees which are liable to injury by excessive heat, frost, &c., and on slopes and shifting sandy soil is of assistance in binding the soil.

Where a cultivator can be used, operations are simplified, but where it is not possible to employ a machine, the trees should be periodically hoed around. Cultivation is particularly desirable in dry areas, and frequently means the difference between success and failure. Cultivation may usually be discontinued as soon as the canopy of leaves offers protection to the soil, or when surface roots interfere with operations. In rabbit-infested country the trees may have to be protected by netting.

Mistletoe growth should be removed as soon as observed. As the roots of this parasite extend below the surface of the wood the whole of the branch infested should be sawn off and burnt where possible.

In many cases there will be a small amount of loss in the trees planted, and these should be replaced as early as possible. Most losses will occur in the first month or so, and replanting should be made immediately. If left until the next season, the "replants" will seldom catch up to the older trees, and are liable to suppression, except where spacing is wide.—A. and P. Notes, N.S.W. Dept. Agric.

### The Premier on Marketing Problems.

Speaking at a Show week function, the Premier (Hon. W. Forgan Smith) referred to the Brisbane Exhibition as a great co-operative effort, in which all those who believed in good citizenship played their part; and no association played its part better than did the Royal National Association. The Governor and the Prime Minister had referred to the amazing productivity of Queensland, and the finding of markets for the State's products. There could be no doubt that the continuance of the economic crisis had made the finding of new markets and the maintenance of existing ones very difficult indeed, but that was no reason why they should despair of the future. The industries one glimpsed at the Show had all had their beginning, and the beginning in some cases was comparatively recent. What they saw that day was the accumulated result of the enterprise, initiative, and industry of those who pioneered this country. The present generation enjoyed the advantages of the pioneers' work, and it was their duty to play their part to preserve those industries, and to hand them on to succeeding generations. Thus could we progress and prove our worthiness of a great heritage. It was unthinkable that Australia should agree to any arrest of development or to restricted production. He agreed that new markets could be found if we sought for them properly and tried hard enough. However, it was essential that Australia should maintain a uniform standard of quality, and must trade to sample if the custom were to be held.

Considerable advantage could be obtained by a system of orderly marketing throughout the year, added the Premier. Through the Acting Agent-General (Mr. L. H. Pike) he had been in close touch with market conditions in London. Britain, of course, was trying to build up her markets to the benefit of her own agriculturists. Economic nationalism was a policy that was being pursued throughout the whole world, and that made it more difficult to get trade. However, Queensland was capable of working out her own destiny in her own way if the people were only brave enough to make the effort. However much they might disagree on non-essentials, he thought it would be agreed that there should be a common effort on the part of all good citizens to attain that standard of comfort and decency which people had a right to demand.

## The Hide worth more than the Carcass.

From the "British United Press":—A farmer at Windhoek, South-west Africa, sold an ox to a local company for 16s. 6d. A little later he thought he would like to have the hide to make reins. So he went to the company and asked the price. "Seventeen and six," he was told. The farmer now invites the world to tell him just how it is that so small a part should be worth more than the whole.

## Pig Research.

A sum of £500 annually has been made available to the Minister for Agriculture (Mr. Frank W. Bulcock) by the rural credits section of the Commonwealth Bank for carrying out research work among pigs in the next two years.

The Minister said recently that he had received this notification from the Premier (Mr. W. Forgan Smith). At the end of two years the grant would be reviewed, and its continuance would depend upon the use that had been made of the money in each year.

Associated with the pig experimental work were certain poultry experiments, and on the recommendation of the Animal Health Board it had been decided to appoint a qualified observer to conduct the nutritional tests.

## Dairy Industry's Contribution to Queensland History.

The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) said at the opening of the Dairy Hall at the Brisbane Exhibition that the dairying industry had made some important contributions to the history of Queensland. The history of such a State was written in terms of primary production. Mention had been made of the co-operative movement. That movement, together with the invention and distribution of separators, had made the industry what it was to-day—a movement of people who recognised the grand old maxim, "United we stand, divided we fall." Co-operation had done more than any other single factor towards the advancement of the industry.

The Minister traversed the difficulties confronting the industry, and the victories won by patient effort, claiming that Queensland was a pattern to the whole of Australia, and was frequently appealed to for advice.

Mr. Bulcock hoped that the time would not be far distant when those engaged in dairying would have an Australian parity, based on Australian conditions of livelihood. They should not, he said, apply one principle to one section of the community, and refuse to apply it to another. He congratulated the dairying industry and those who joined with them in staging the fine exhibit, and expressed pleasure in declaring the new Dairy Produce Hall officially open.

## Fewer and better Cows—The Secret of Profitable Dairying.

Fewer and better cows should be the aim of every dairy farmer. This contention is well supported in a bulletin of the Idaho (U.S.A.) University. Of the following herds, asks the publication, which is the best?

(1) Twenty-two cows, each producing 200 lb. fat, returning 1,000 dollars over feed cost.

(2) Twelve cows, each producing 300 lb. fat, returning 1,000 dollars over feed cost.

(3) Nine cows, each producing 400 lb. fat, returning 1,000 dollars over feed cost.

The correct answer, replies the writer, is "Herd No. 3," because while each herd returns 1,000 over feed cost—

The 22-cow herd produced 800 lb. fat (22 per cent.) more than either of the other herds, which tends to build a surplus and depress prices.

The 22-cow herd required 38 per cent. more feed than the 12-cow herd and 58 per cent. more than the 9-cow herd.

The 22-cow herd required more time and labour and greater expenses in shelter and taxes than either of the other herds.

The 12-cow herd produced butter-fat at a feed cost of 24 per cent. lower than the 22-cow herd.

The 9-cow herd produced butter-fat at a feed cost 32 per cent. lower than the 22-cow herd.

**Sweet Potatoes.**

During recent years in New South Wales, the sweet potato has become more popular as a vegetable, largely due to a general improvement in quality in the varieties grown by farmers. This crop attains its best development in the warm coastal regions, and the varieties which have been popular up to the present are Nancy Hall, Yellow Strassburg, and Southern Queen, which were introduced from the United States of America some years ago.

With a view of further improvement on these varieties the Plant-breeding Branch of the Department has been active during the past few years in introducing additional new varieties as well as seed for raising new seedling varieties. This work is being carried out by Mr. W. H. Darragh, Grafton Experiment Farm. Mr. Darragh reports that Brook's No. 3, a seedling variety originated by Mr. G. B. Brooks, of the Queensland Department of Agriculture, is vastly superior in yield at Grafton to the above-mentioned varieties, and another called Hawaii (being an unnamed variety introduced from that country) is also superior to them. It is expected that when these varieties become better known they will largely supplant the American varieties.

A few additional promising seedlings raised from seed introduced from Hawaii are also under observation at Grafton.

**Tanning Pig Skins.**

Of all skins likely to be tanned on a farm, pig skin is probably the most difficult to handle, and, unless the operator has plenty of time and patience and is in no hurry, it would be better to send such skins to a recognised tannery where they could be tanned under modern conditions and a good job guaranteed. Tanners charge from 8s. each upwards for tanning pig skins of from bacon pig to breeding sow size, plus freight charges.

To prepare a skin for tanning, exercise considerable care in removing it from the pig carcase to avoid cutting holes in the skin, for these ruin the finished product and make it unsightly. The experienced tanner suggests using a sharp axe as a knife, and not the ordinary butcher's knife, the axe to be used after opening up, like using a knife, the objective all through being to remove as much fat and flesh as possible and to have a clean skin. When removed from the animal, spread the skin on a board about the width of an axe, or a little wider, on a slope about waist high so that the operator can lean against the skin to hold it; then use the axe in a shaving method to remove fat and gristly portions. After cleaning the skin in this manner, lay it out flat on a clean board floor and cover well all over with plenty of salt for about a fortnight. If a sharp axe is not available and a knife must be used, use it as in shaving and not in cutting; when rough fat has been removed and skin is clean the salt will penetrate.

It may be advisable to try removing more fat after a day or two and resalting afresh, as the fat is very resistant. If required, a tanning pickle can be made, using salt and water, sufficient salt being added and well stirred to make a potato float. Soak the skin in this pickle for a few days, and then salt for ten days as suggested, and then dry.

If the skin is a valuable one, the small amount of money required to have it prepared at a tannery would be money well spent.—From notes supplied by Mr. C. A. Albrecht, of Musgrave terrace, Alderley, Queensland.

**Selection of Seed Maize.**

Select ears which are heavy in proportion to their size when dry. Soundness, weight, plumpness, and good bright colour of grain are of more importance than depth of grain. Deep grain may be light and chaffy and of poor colour and feeding value. Select ears true to type or thoroughly representative of the variety. Avoid ears with wide furrows between the rows of grain. Soft, rough-dented grain is more likely to carry the infection of root, stalk, cob, and grain rot disease than medium-hard grain of smooth to medium-rough dent. Do not strive too much after small cores. Well-filled tips make a good show point, but poorly filled tips do not necessarily disqualify otherwise good seed ears. Straight regular rows are only a fancy show point, and need not be stressed greatly in selecting seed. Avoid selecting ears showing split, mouldy, or darkened grains, as they are indicative of infection from root and stalk disease. Also avoid ears which on being detached from the stalk show a shredded, stringy, or discoloured (especially pink coloured) stalk attachment. Avoid ears which shell grain with a stringy tip cap.

### Care of the Spray Pump.

Before putting the engine of a power spray plant away for any lengthy period, all working parts should be wiped down and well swabbed with oil. The outfit should be kept under cover from the weather. Unless oil sprays are being used (which do not cake around the valves or chambers or corrode the metal), the pump should be rinsed every night on completion of spraying. Care should be taken in doing this first to rinse the tank out and then pump through clean water with the hoses off to give a clear outlet.

The hose also should be rinsed every night by pumping water through it with the nozzles off; if oil has been used soda should be dissolved in the water used for rinsing, a cask of prepared soda solution for this purpose being kept on hand during spraying operations. The operation should be carried out either after the pump has been first thoroughly rinsed, or with a separate small pump.

Care in this way will lengthen the life of a hose to a very appreciable extent. The thorough drying out of the hose when put away has not been found to be necessary; in fact, provided it is from clean water, moisture in the hose is possibly beneficial. Avoid, however, hanging the hose close up to an iron roof or in any hot place. It should be kept covered with bagging or similar material.

### Trees on the Farm—Homestead Shelter Belts.

Shelter belts about the homestead serve a dual purpose. They increase the comfort of the dwelling, making it a much more pleasant place to live in, and also provide an attractive setting or background for the buildings. They may also be used for screening off unsightly buildings, stock yards, &c.

Very little attention is usually given to the planning of the homestead and its surroundings, but consideration of the needs of the locality, combined with a proper planting scheme, would add considerably to the comfort of the one and the benefit of the others. For instance, where ground is not expensive, a 5-acre tree lot of 20 by 40 rods could be planted on the western side of the homestead. This would not only cut off the bleak or hot westerlies, but would form a source of timber supply for all farm needs, apart from the picturesque effect it would give to the holding. Along the southern side a shelter belt could be planted of one or several rows of trees, according to the ground available. The orchard and vegetable garden could be located within the protected area.

Such belts should not be planted too close to the house, as the trees would unduly shade the buildings during the winter months, fire risk would be increased, and tanks and drains would be blocked up by leaf litter. Further, close planting tends to spoil the individuality of the homestead building, more distant planting providing a much more effective background. The nearest shelter should be not much less than 100 yards from the dwelling, the intervening ground being planted with individual shade and ornamental trees if so desired. Planting too close to dairy or stock yards is particularly undesirable, as the shading in winter makes them wet and sloppy.—A. and P. Notes, N.S.W. Department of Agriculture.

### Milk for Chickens.

The value of milk for chickens is generally recognised, but it is perhaps not so well understood that when fed in conjunction with other foods it has a value far beyond that which its chemical constituents would indicate. Milk is of great value as a liquid with which to mix the soft food, owing principally to its vitamin content.

Many operators give their chickens milk to drink. This may work well enough with small lots run with hens, but it is most objectionable and dangerous when large numbers are run together in heated brooders, or where they have to crowd together for warmth. Milk cannot be given to chickens to drink without their down and feathers becoming besmeared with it, and an insanitary condition is thus created which is likely to encourage disease—in fact, it may bring on the very condition that one often sees sour milk recommended to cure—namely, diarrhœa.

In no circumstances should milk form the only liquid given to chickens to drink. Water should always be available to them in addition.

### Organised Marketing.

Consequent on the High Court judgment in what is known as the peanut case, the early introduction of legislation which may vitally alter the constitution of the Queensland Council of Agriculture is contemplated to meet the new position.

At the same time, the strengthening of the usefulness of the Council and a revitalising of the Local Producers' Associations will be objectives.

The announcement was made by the Minister for Agriculture and Stock (Mr. F. W. Bulcock) when, at the annual meeting of the Council of Agriculture, he was acknowledging his re-election unopposed as president of what, he said, was in essence a "farmers' parliament."

The past twelve months, he declared, had been a time of unprecedented difficulty for the organisation, and they now were on the threshold of a new era. Now that the judgment in the peanut case was known they could go ahead with a policy of reconstruction, making a determined effort to meet the difficulties with which they were confronted. The need for a co-ordinated orderly form of marketing was recognised, and he could not for a moment believe that there ever could be any return to the old chaotic form of marketing their primary produce. Such a retrogression would be disastrous for the individual, the industry, and the State, for primary production was the base of the wealth of the State, and with the prosperity of the producers was inextricably linked the welfare of the whole.

"I expect big changes will take place in the coming year," continued Mr. Bulcock. "At present I have a Bill that may vitally alter the conditions under which we meet to-day. There may be some factors associated with the peanut judgment which may cause me to make some material changes in the constitution of our organisation. As president of the organisation and a member of the Government I give you my honourable assurance that whatever I do will be done with due regard to the interests of the primary producers and primary production generally. There will be no emasculation of the organisation, but rather the giving of further strength to it to pursue the objective and functions for which it was created."

From the testing time of the last twelve months the Council of Agriculture had emerged with unimpaired strength and ever higher in the respect of the people for the manner in which it had faced the difficulties. Pessimists, often interested parties, had urged that with the peanut judgment they were at the end of their sphere of usefulness, and that the organisation should be abandoned. The position was entirely to the contrary, and with the loyal co-operation of the farmers themselves and of the contributory units great progress was in sight. Thus he thought the next move would be to broaden the sphere of the organisation as, in effect, the economic advisers to the body of people who were the producers, and also to give the local producers' association units of the organisation some added objective for which to strive.

He pointed to the community of interest between all forms of primary production, pastoral, dairying, or general agriculture, and said he would like to see the local producers' associations more intimately associated with experimental work, supplementing that done by the Department of Agriculture and Stock, and in co-operation with it. Among many other valuable lines of experiment was that for instance, associated with grasses. He saw no reason why every local producers' association should not engage in experimental work of some kind. That would materially tend to the rejuvenation of the local producers' association spirit, for they would be contributing to the well-being of their district and State and additionally demonstrating their value. He pointed to the progress made in Britain, America, and Germany in primary production organisation, and expressed the belief that Queensland, through its organisation, could make a very valuable contribution towards the solution of world problems—a solution which could not be found through limitation of production.

## ELECTION OF OFFICERS.

The Minister was appointed president on the nomination of Mr. J. McRobert, seconded by Mr. H. T. Anderson, and supported by Messrs. W. L. Osborne and C. Bateman. Mr. Jas. McRobert was elected vice-president without opposition. The following were elected members of the executive:—Messrs J. McRobert, W. J. Sloan, H. T. Anderson, and J. C. Brimblecombe (representing the commodity boards), and V. Baker. J. Gargan, and W. Fielding (district representatives).

### Salt for Pigs

In an article "Salt for Stock" in *The Scottish Journal of Agriculture*, Mr. W. Thomson, of the Rowell Research Institute, Aberdeen, says that the belief that salt is "poison" to pigs is difficult to understand when it is realised that pigs fed on kitchen refuse, hotel switt, &c., would obviously be having their food seasoned with salt to the human taste. In present-day practice at Research Stations pigs are regularly fed rations containing 1 to 2 per cent. of salt, and those fed on large amounts of potatoes and maize will readily lick salt placed in their pens.

In a test to determine whether salt had toxic (poisonous) effect, increasing amounts up to 2.5 oz. of salt per day were fed to pigs without any harmful results, the animals gaining normally in weight. One concludes from this study, says the writer, that it pays to give pigs access to salt at all times. These conclusions are on the assumption that water is also available for the use of the pigs at all times, for it is well known with humans that the more salt we eat the more water we need to drink, and if the pig is fed on increasing amounts of salt in the absence of water, results would probably be disastrous.

### Young Farmers in the Old Country.

A young farmer in England is anyone of either sex between the age of ten and twenty-one who is a member of a young farmers' club. Such a member looks after poultry, a calf, a pig, sheep, rabbits (in the United Kingdom, of course), bees, or a garden in which vegetables and flowers are grown. They keep records of their work, and their accounts show the money they receive for the sale of their stock and produce and the money they spend on feeding stuffs, manures, and so forth. They choose a committee from among themselves, with a chairman to preside, and secretary to write minutes and letters, and a treasurer to keep club accounts. This committee arranges the meetings at which young farmers and others discuss the feeding of animals, the cultivation of the soil, and similar topics. The clubs also arrange shows at which their livestock and their vegetables and flowers are exhibited, and where they compete for prizes offered by various bodies. All affiliated young farmers are entitled to wear a young farmers' badge. All persons wearing this badge ard friends of one another.

Each farmer club has a leader, an older person, who helps any member who wants help and advice in his work. The clubs also have an advisory committee composed of older and more financial persons who are experienced in stock-raising and gardening. This committee helps any member, especially with the buying and selling of stock and produce. Young farmers can buy and read a paper called *The Young Farmer*, which is published quarterly. This paper is full of pictures and articles about young farmers and their work. There are young farmers' clubs all over England and Wales, and the organisation works under the auspices of the Ministry of Agriculture and Fisheries, London.

### Council of Agriculture.

In conformity with an amending Act passed last year an Order in Council has been issued declaring that the number of members of the Council of Agriculture shall be twenty-seven.

The Primary Producers' Organisation and Marketing Acts provide that the council shall consist of the Director of Marketing, representatives of commodity boards, the Committee of Direction of Fruit Marketing, and the State Wheat Board, also one representative for each of the nine districts embracing local producers' associations. Regulations have been approved which prescribe the nine districts embracing the local producers' associations. Provision is also made for the appointment, at the annual meeting of the Council of Agriculture, of an executive committee, consisting of not more than ten members. The committee shall include the president, vice-president, Director of Marketing, two representatives of the Butter Board, two representatives selected by, and from among all representatives of the council, with the exception of the district representatives and three representatives selected from among the nine district representatives.

A special regulation has been issued prescribing the members of commodity boards who shall be members of the council, and these include two representatives of the Butter Board. Mr. J. McRobert, of Maryborough, and Mr. W. J. Sloan, of Malanda; one representative of each of the remaining boards; Messrs. H. T. Anderson, Biddeston (Cheese Board), J. Beck, Stanwell (Cotton Board), W. Bailey, Atherton (Atherton Maize Board), C. Brumm, Woongoolba (Arrowroot Board), N. J. Christiansen, Wooroolin (Peanut Board), C. W. Edwards, Kingston (Honey Board), H. Kessler, Cambooya (Barley Board), A. McLauchlan. Boonah (Egg Board), H. Niemeyer, Hatton Vale (Broom Millet Board), G. D. O'Neill, Allora (Canary Seed Board), H. T. Skennar, Malanda (Northern Pig Board), W. Ranger, Brisbane (Committee of Direction of Fruit Marketing), G. Johnson, Mackay (Queensland Cane Growers' Council), and W. J. Brimblecombe, Pirrinuan (Wheat Board).

The Governor in Council has appointed the following representatives of Districts Nos. 1 to 9, embracing local producers' associations, to be members of the Council of Agriculture:—J. E. Harding (Dalma Scrub), No. 1 Central Queensland; V. Baker (Gayndah), No. 2, the Burnett; W. L. Osborne (Wondai), No. 3, South Burnett; E. Brabiner (Green's Creek, Gympie), No. 4, Wide Bay; C. Bateman (Woodford), No. 5, East Moreton; W. A. Fielding (Blenheim), No. 6. West Moreton; J. Buckley (Rose Hill), No. 7, Darling Downs; W. E. Ashford (Hannaford), No. 8, Western Downs; J. Gargan (Atherton) No. 9, Atherton Tableland.

**To Keep Weevils out of Stored Skins.**

When skins are to be stored some time, especially in the summer months, it is advisable, as soon as possible after they have cooled off, to paint the pelts with some solution to keep away weevils and other pests, which do considerable damage by eating into them, thus reducing their value. Once the weevils get into the skin it is a difficult matter to remove them, and the longer they remain the more damage they do. Care must be taken to paint the pelt thoroughly, as unless this is done the weevils get in at the points and in small pockets and soon riddle the whole piece.

Cheap and effective mixtures for this purpose are made up as follows:—

(1) Arsenic, 4 oz.; soda crystals, 8 oz.; water, 1 gallon. Boil all together until dissolved, and when cool apply with a soft brush.

(2) Arsenic, ½ lb.; soda, ½ lb.; water, 1 gallon. Boil for half an hour.

(3) Arsenite of soda, 1 lb.; water, 4 gallons. Boil together.

(4) Soda ash, 5 lb.; Barbadoes aloes, ¼ lb.; water, 4 gallons. Boil together, and when the mixture rises pour in 1 gallon of cold water. One part of this stock solution to five parts of water would be the proportions to use when required.

All of these mixtures are highly poisonous, and must be legibly branded as such. When not in use keep under lock and key.

These mixtures are also used for painting dry hides and all descriptions of marsupial skins. Paint the pelts with the solution, using an ordinary whitewash brush. Be careful to see that the pelts are thoroughly dry before bundling, as wet skins soon go mouldy and depreciate in value.

**White Wash on the Dairy Farm.**

Whitewash is generally considered indispensable on the dairy farm. Poorly made and improperly applied, however, it can become a source of trouble when it flakes off or cracks in such a way as to provide harbour for dust and filth.

In the first of the recipes given hereunder tallow or fat is included. Some dairymen object to the use of such substances in whitewash, though if mixed thoroughly with the lime during the process of slaking they lose much of their fatty properties, and for the peace of mind of those who prefer whitewash without fats or oils as binders a second recipe is given. Recipe No. 2 is not suitable for galvanised iron, whitewash containing any appreciable quantity of salt having an injurious effect.

*Recipe No. 1.*—Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better, as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle." Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 lb. to 14 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.

*Recipe No. 2.*—In a manner similar to that described above slake half a bushel of lime. Then strain the liquid through a fine sieve or strainer and add to it a quarter of a bushel of salt previously dissolved in warm water. Next take 3 lb. ground rice boiled to a thin paste, and stir in while hot ½ lb. Spanish whiting and 1 lb. of clear glue previously dissolved by soaking in cold water and then hanging over a slow fire in a small pot hung in a larger one filled with water. Add 5 gallons of hot water to the mixture, stir well, cover it from dirt, and let it stand a few days. For best results this whitewash should be applied whilst hot.

**Licks for Sheep—Economies in their Use.**

Most stockowners are in the habit of providing some kind of lick for their stock, but it is safe to say that relatively few of them are fully aware of the chief requirements of such a lick and of the best and cheapest manner of supplying the essential ingredients. Many have adopted an empirical formula, which actually supplies very few, if any, essential constituents. Others purchase proprietary mixtures at relatively high cost, and while the results are in some cases good, the price actually paid is out of proportion to the gain obtained.

**Lime-water for Calves.**

Besides being a necessary mineral constituent for all classes of animals, lime acts also in correcting acidity in the stomach. It also renders the curd portion of milk readily digestible, particularly by young calves.

Lime-water of the requisite strength is easily made on the farm. There need be no fear of making it too strong, as water will only dissolve a certain limited amount of lime—½ grain to the ounce, or 10 grains to the pint. Add a bucketful (say, 20 lb.) of lime to about 10 gallons of water in a wooden barrel, stir well, and allow to settle. The clear liquid resulting can be used, and water added and stirred daily until all the soluble portion of the lime has dissolved—the lack of alkaline flavour will indicate when this point has been reached, and a fresh supply of lime should be added to the barrel.

**Points in Maize Cultivation.**

The improvement of the fertility of the soil is one of the most important methods of increasing the yield of the maize crop. Following are some hints in this relation:—

1. It is practically impossible to make the soil too rich for maize. This does not apply to some other crops.

2. Some other crops will make better utilisation of poor land or even second-class soil than maize.

3. Some rotation or change of crops is desirable in maize-growing.

4. Where land receives periodical enrichment by silt from flooding, the fertility of the soil is usually well maintained; but where this is not the case, recourse must be had in time to artificial methods of maintaining or increasing the fertility of the soil if good yields are still to be obtained.

5. Grass pasture, or perennial or biennial crops like lucerne and the different clovers, are the best crops to precede maize. The following results were obtained at one of the New South Wales Department's farms:—

| | |
|---|---|
| Maize after oaten hay .. .. | 21 bus. 22 lb. per acre |
| Maize after red clover .. .. | 43 bus. 15 lb. per acre |

6. Farmyard or stable manure, where readily procurable, is the most valuable manure for maize. Tests in America over thirty years have given an average increase of 25 bushels per acre in the yield of maize from a moderate periodical dressing of animal manure.

7. Green manuring with, or the feeding off of leguminous crops like cowpeas, soybeans, vetches, and field peas increases the yield of the succeeding maize crop. The following results were obtained at a departmental farm in New South Wales:—

| | |
|---|---|
| Maize after sorghum .. .. | 49 bus. 40 lb. per acre |
| Maize after maize .. .. .. | 54 bus. 7 lb. per acre |
| Maize after cowpeas .. .. .. | 62 bus. 26 lb. per acre |

The fertility of the soil depends in a large measure on the presence of sufficient quantities of humus or organic matter, and of nitrogen, phosphoric acid, and potash in available form. The organic matter and the nitrogen may be well maintained by the foregoing methods, but the mineral requirements of plants in soils deficient in available forms of these ingredients can only be met by the addition of fertilizers. Most soils with continued cropping become deficient in available minerals, particularly phosphates, which are fortunately the cheapest to replace.

The following average results over a series of years have been obtained with fertilizers on maize on farmers' experiment plots in New South Wales:—

| — | Coastal. | Tumut. | Tableland. |
|---|---|---|---|
| Fertilizer (superphos phate) per acre .. .. | 2 cwt. | 2 cwt. | ½ cwt. |
| Increased yield per acre due to fertilizer .. .. | 9 bushels | 11 bushels | 5 bushels |
| Cost of fertilizer per acre .. .. .. .. | 10s. | 10s. | 2s. 6d. |
| Profit per acre from use of fertilizer .. .. | £1 10s. | £1 19s. | £1 |

It must be remembered that fertilizers have their best effect on soils which are well supplied with organic matter, and which therefore hold moisture well.

If a crop does not make use of fertilizer in a dry season, the residual effect is seen in the subsequent crop.

# PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, the Ayrshire Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of May, 1933 (273 days period unless otherwise stated):—

| Name of Cow. | Owner. | Milk Production. | Butter Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| AUSTRALIAN ILLAWARRA SHORTHORNS. | | | | |
| MATURE COW (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| Kilbirnie Bella 10th | Macfarlane Bros., Radford | 14,604·84 | 615·699 | Mowbray of Darbalara |
| Olive 10th of Cedar Grove | C. O'Sullivan, Greenmount | 12,002·55 | 468·856 | Dandy of Ocean View |
| Plum of Gleuleigh | C. O'Sullivan, Greenmount | 11,199·86 | 459·434 | Alpha |
| Blue Bell 4th of Morden | Mr. C. A. Littleton, Crow's Nest | 9,267·35 | 414·758 | George of Nestles |
| Penrhos Dove | A. Sandilands, Wildash | 7,983·25 | 359·067 | Admiration of Strathdhu |
| Favourite of Mountside | R. R. Radel, Coalstoun Lakes | 8,780·1 | 350·282 | Plum of Hillview |
| JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB. | | | | |
| Glendalough Queenie III. | Hickey and Sons, Wilston | 13,414·95 | 456·98 | Don of Springdale |
| Olive 12th of Cedar Grove | C. O'Sullivan, Greenmount | 10,943·42 | 417·776 | Mabel 2nds Victor of Coral Grange |
| SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | | |
| Lu Lu 4th of Headlands | G. Heading, Cloyna | 10,851·01 | 376·956 | Duchess' Jellicoe Fairfield |
| JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | | |
| Model 2nd of Alfavale | W. H. Thompson, Nanango | 11,331·45 | 493·664 | Reward of Fairfield |
| SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | | |
| Blacklands Emlyn | P. J. Skerman, Kaimkillenbun | 6,063·99 | 311·018 | Envoy of Blacklands |
| Euroa Belinda | H. F. Lindenmayer, Binjour Plateau, Gayndah | 7,197·4 | 280·336 | Bright Laddie of Roselea |
| Wandegong Jean | G. D. Lindenmayer, Mundubbera | 7,230 | 275·062 | Emperor of Spurfield |
| Mermaid 6th of Arley | E. E. D. Lawley, Maleny | 6,194·8 | 270·656 | Defender 2nd of Huntleigh |
| Maud III. of Bellwood | W. G. Currant, Gunalda | 6,964·35 | 254·506 | Statesman of Bellwood |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| Millstream Beryl | W. J. Barnes, Cedar Grove | 7,628·5 | 345·927 | Magnet of Kurrawong |
| Balcarres Dot | Mrs. C. A. Littleton, Crow's Nest | 7,412·2 | 331·486 | Bugle Boy of Morden |
| Euroa Viola | H. F. Lindenmayer, Binjour Plateau | 8,034 | 316·250 | Bright Laddie of Roselea |
| Millstream Favourite (249 days) | W. J. Barnes, Cedar Grove | 6,591·73 | 271·964 | Wunulla Planet |
| Lorna 10th of Arley | E. E. D. Lawley, Maleny | 5,744·32 | 234·227 | Defender 2nd of Huntleigh |

| | | | | |
|---|---|---|---|---|
| **JERSEY.** | | | | |
| MATURE COW (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| Trecarne Rosella | T. A. Petherick, Lockyer | 9,450·37 | 563·583 | Trinity Officer |
| Maria of Lyndhurst | J. B. Keys, Gowrie Little Plains | 10,157·91 | 429·03 | Rosebuds Milklad of Waaragaburia |
| Trinity Devotion | F. P. Fowler and Sons, Coalstoun Lakes | 7,187·65 | 400·038 | Trinity Governor |
| Noble Sultane of Brooklands | F. P. Fowler and Sons, Coalstoun Lakes | 7,089·75 | 378·413 | Montrose Farms Noble |
| Sultan's Mabel II. of Brooklands | W. S. Conochie, Sherwood | 7,012·92 | 352·883 | Oxford Palatine Sultan |
| SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB. | | | | |
| Hazelhurst Golden Lilly III. | F. Maurer, Darra | 9,232·69 | 456·598 | Carlyle Rural King |
| Belleefaire Belle Bonbon | F. J. Cox, Imbil | 8,077·05 | 445·057 | Masterpiece Yeribee of Bruce Vale |
| SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | | |
| Queenie 2nd of Wattle Grove | J. McInally, Brassall | 8,652·02 | 483·536 | Golden Palatine of Morago |
| JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | | |
| Lyndhurst Marella | J. B. Keys, Gowrie Little Plains | 9,803·37 | 507·356 | Mercedes Noble King of Ogilvie |
| Trecarnlea Daisy | T. A. Petherick, Lockyer | 6,033·81 | 304·458 | Trinity Officer |
| SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | | |
| Trecarne Rosella 4th | T. A. Petherick, Lockyer | 7,978·43 | 449·148 | Trinity Officer |
| Bremerside Sunrise | B. Jensen, Rosevale | 6,977 | 330·02 | Oaklands Cream Lad |
| Bremerside Ena's Pride | B. Jensen, Rosevale | 5,831·5 | 319·037 | Kelvinside Noble Chieftain |
| Trecarne Sweetbread 2nd | T. A. Petherick, Lockyer | 5,271·02 | 279·472 | Trecarne King |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| Greenstock Poppy | J. B. Keys, Gowrie Little Plains | 9,318·11 | 479·756 | Greenstock Commander |
| Glenview Audrey Twylish | F. P. Fowler and Sons, Coalstoun Lakes | 6,129 | 349·027 | Carlyle Larkspur 2nd Empire |
| Bremerside Flower | B. Jensen, Rosevale | 5,831·5 | 318·003 | Kelvinside Noble Chieftain |
| Waverley Progression | D. R. Hutton, Cunningham | 6,460·48 | 296·05 | Oxford Gems Noble III. |
| Bremerside Belle | B. Jensen, Rosevale | 4,868·5 | 275·818 | Kelvinside Noble Chieftain |
| Daphne of Burnleigh | W. Mallett, Nambour | 5,274·25 | 268·44 | Trinity Darby |
| **GUERNSEY.** | | | | |
| SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | | |
| Linwood Columbine | A. S. Cooke, Maleny | 6,574·65 | 353·609 | Linwood Royal |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| Linwood Treasure (269 days) | A. S. Cooke, Maleny | 5,775·3 | 311·528 | Linwood Rival |
| Linwood Ruby | A. S. Cooke, Maleny | 6,006·7 | 307·502 | Moonji Bright Boy |
| Laureldale Gem | W. Cooke, Maleny | 4,680·45 | 236·701 | Linwood Favour |
| **AYRSHIRE.** | | | | |
| MATURE COW (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| Longlands Bella III. | T. Holmes, Yarranlea | 9,803·12 | 377·804 | Prince Roy of Fairview |
| **FRIESIAN.** | | | | |
| MATURE COW (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| College Pontiac Princess (365 days) | Hickey and Sons, Wilston | 24,027·28 | 829·58 | Pabst Pontiac Blue Star |

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# The Home and the Garden.

## OUR BABIES.

(Issued by the Queensland Baby Clinics.)

*Under this heading we issue a monthly series of short articles dealing with the welfare and care of babies, in the hope of increasing their health and happiness, and decreasing the number of unnecessary deaths among them.*

### CHILD WELFARE.

MOST important are the early beginnings of all things. Especially is this true of health. On the health of the mother depends the health of the infant; on the health of the infant depends the health of the child; on the health of the child depends the health of the adult; on the health of the adult depends the health of the State; and these must not be left to chance.

Largely they have been left to chance. Of recent years something has been done to promote health, something apart from the attempt to cure disease by hospitals and other means. Let us clearly understand that disease is nothing in itself, but only the absence of health, and that it is by the cultivation of health that we can best diminish disease. If our people are to be healthy, they must learn to think in terms of health, and not in terms of disease. They must pursue the living fact, and not waste their energies in struggling with shadows.

There are three things that are now of the greatest importance. Firstly, the care of the expectant mother. This care is the responsibility of her medical adviser. The Lady Bowen Hospital has an Ante-natal Clinic, so have other Maternity Hospitals, and there are Ante-natal Clinics in the Valley and Woolloongabba. We must so educate our mothers that the excellent work done by all these shall be multiplied tenfold. For want of knowledge mothers and infants die or are crippled in health. Most pathetic is the loss of life and the survival of weaklings owing to the want of this care, which is freely offered to all mothers who will seek it.

Secondly, we need to extend our Infant Welfare work so as to reach as far as possible every mother and infant in the State. In the last fifteen years our infant mortality has fallen by more than one-third. Infant Welfare has well earned the right to further extension and perfection.

Thirdly, the health of the young child is now a pressing problem. Ill-health and deaths from infection are far too common. We must spread knowledge of the ways to prevent the spread of infection and to increase the resistance to infection by a sound diet rich in vitamins. Something has been done in this direction, but much more remains to be done. By special means we can give immunity to diphtheria and typhoid fever, and can surely eradicate hookworm; but against other infections very little has been done.

Let us do these things that we can, and presently we shall be able to do things that are now impossible.

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## THE FLOWERS O' THE FOREST.

### BE TRUE TO THE TREES.

*"REDGUM," a noted regular contributor to the "Sydney Morning Herald," has this to say in a recent issue of that journal:—*

NEVER at any time was there greater need for kindly thought and action on behalf of our own individual trees and for those which belong to the nation.

The great awakening is near at hand. Men and women are beginning to realise that the tree means something more than fuel for the home fire and wood for building purposes.

For generations we have done our utmost to pull down and spoil the living beauties of the landscape, hoping that the remnants would satisfy our souls and serve our purposes just as well. Over fifty years of spoilation have proved that our ways and works are those of the destroyer and not those of the nation-maker.

Australia has trees which any other people would love and cherish with all their hearts. Her trees and her landscapes, her seasons and her skies are among the greatest of our assets. Only the hand of the axeman can rob us of our tree heritage. This land of brilliant sunshine is made beautiful by our climate and our trees. Only now in these great and inspiring days are men and women learning to realise what power and profit, poetry and pictures our Australian trees may be in themselves. No one who gives his heart to the love of the eucalypts, the flames, the wheel trees, or the pines of Australia will ever have reason for regret.

The whole Japanese nation bows reverently before the glory of the springtime which comes in the soul of the cherry trees. Are our Illawarra flame trees, scarlet eucalypts, and wheel trees any less attractive than the cherry of Japan? No tree that tosses its glory into the air for the eyes of man to feast upon could ever do better work than the queen of the coastal brushlands, which one knows as the flame or fire tree. The city that gives this picture-maker the prominence it deserves will win fame and prove attractive to visitors.

But not in every situation will this exquisite flame tree do its best work. It is a lover of warmth and partial shelter, and should be worth making at home in our coastal parklands even if some of the hardier native subjects have to be used to bear the brunt of the great gales.

### Gay and Glorious Gums.

In the same honoured place would I set the colourful gums which are still clamouring for recognition. We have nothing finer around Sydney than the trees growing in Countess avenue, Mosman. There many well-grown subjects have planted themselves in the landscape, with their roots deep in the stony soil.

I saw this company during the early summer when they were at their best, and wondered how it was that so few tree lovers were paying them attention. For sandstone country with a northerly exposure the scarlet gum is a serious rival to the flame tree, which has been given the pride of place.

Next on the list is Queensland's wheel tree, a stenocarpus, with a great colourful heart and a foliage that is hard to equal. The blossoms are massed in brilliant clusters, each flower being shaped like a small wheel with a double set of scarlet spokes which join at the rim and carry a ball of crimson or gold.

The jacaranda, silky oak, Cape chestnut, and catalpa are also among the immortals. Of these I have spoken on several occasions. Every man and woman who loves a flowering tree has a kind word for each of them.

In any place to its liking, the Moreton Bay chestnut can also display powers which are not often seen on or near the suburban roadsides. The foliage is like well-polished duco, and the blooms are orange suffused with scarlet. Heads full of character and charm are pieced together in the early summer. Only for a short time during the winter is there any loss in the colour of the leaves.

### Pink Flowered Kurrajong.

The large-flowered pink kurrajong, listed as *Sterculia diversifolia,* will one day be given an honoured and prominent place among Australia's best flowering trees. It is a big grower and carries a large rosy pink bell-shaped blossom with a patch of rosy claret in the centre. For months during the summer the flowering continues. The tree is well known to the owners of scrubland on the lower North Coast. In the Gloucester district it is greatly admired.

A striking and delightful bauhinia often listed as a mountain ebony or butterfly tree can hold its own in any good company. The blooms are not unlike azaleas. They break out of the bark on short footstalks, and at times just smother the whole tree. *Hookeri,* I think, is the name of the variety carrying white flowers that are edged with crimson. The snow-white bauhinia cannot be equalled by any of our warm-country flowering trees.

Among the many brilliant native workers, which our tree propagators have sadly neglected, is a jagera, at one time known as *Cupania pseudo-rhus.* This superb evergreen ripens bunches of ruby-velvet coloured seeds that are carried after the manner of some of the smaller wattles. It is a gem thing, with plenty of character and quality. Quite ninety-nine tree-lovers out of every hundred seeing the rhus-like foliage and the bunches of velvet seeds would fall in love with it at first sight. It is one of the most joyous of our little-known natives and comes, I think, from the coastal scrubs. If half the work attempted with the soulless black fig was given to some of our better class Australian natives, our eyes would be opened wider. Surely we have had enough of our city parklands and suburban streets blighted by the uninspiring members of the fraternity of figs!

A full day's work always lies ahead of the tree planter. On that work the health and happiness of the young trees will always depend. Planting is one thing, holding the young trees together through the long, hot days of summer is quite another.

The history of the public and school tree-plantings done during the last twenty years clearly shows that overmuch energy was displayed at the time of planting, and that too little thought was paid to the young trees after their placing.

For many years prior to the closing of the State Nursery at Campbelltown over 150,000 young trees were distributed free to schools, municipalities, shires, public institutions, and also to private citizens. Not one-tenth of all those young trees were privileged to grow up. What was the reason for their failure? No better stocks were ever supplied to anyone; the fault was not with the trees. All that great misfortune can be debited against the methods of the men and women who permitted the trees to die for want of water and attention.

### What After Care Means.

That brings me to the story which I desire to make prominent. Trees that are left to dry out after planting have been thrown away.

We can do the young trees that were planted yesterday or to-day, as well as those that will be planted before the hot weather begins, a great service by determining to act differently in future. As good citizens, we are in duty bound to remain true to the tree children that we plant on the highways and in the great or small gardens.

Too often the trees, both public and private, are planted in places where the hardiest of weed things could not hold itself together. That is where too many of the wrongs begin.

A hole dug in a hard patch of heavy loam, with every facility for the intake of rain, but no provision for draining away the surplus water, that only swamp and bog plants can live with, is one of the commonest of tree-planting faults. Good and thorough preparation of the soil is necessary before any planting is done in heavy land, where the subsoil holds water. In light country little or no preparation for the drainage is necessary. Sandy soils are hard to hold moisture enough to keep the young trees alive.

Watering, too, entails a lot of work. In many places where trees are planted little or no water is available, and no labour can be spared to keep the soil surface open to give the young stocks a chance to profit by the moisture which works through from below the ground line.

In many instances it is far better to refrain from watering young trees early in the summer rather than force them to make a false growth, which they will be unable to maintain. If helped by surface hoeing, young trees and older trees both quickly accommodate themselves to the ruling condition. Where they are forced out of their partially dormant state by watering, which cannot be kept up, they too often succumb to the strain, and die before the change in the weather conditions helps them out of trouble. Trees and flowering plants require mothering all the time. Those which are forgotten very soon fail.

### Provide Ample Room.

Do not plant trees that grow, as do most of our gums, in places where they will not be able to display their full beauty. A young silky oak planted within 15 or 20 inches of a dividing fence is quite out of place. An oak or an elm, a fig or a plane, in a corner where there is not room enough for a rose bush, will never be seen to advantage. A street tree placed within a few feet of a telegraph pole is also improperly planted. A row of giant trees grown in hedge formation against a neighbour's fence, too, is a thoughtlessness which should be avoided. If our trees are worth what we think they are, every possible effort should be made to encourage them. We owe to them the best service in our power, and nothing less will repay them for their good work.

# Orchard Notes for October.

## THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised. Unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering, as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material, and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of those spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitaceous plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during the month. See that

the land is properly prepared and that good, healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to these parts of the State; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the Western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after, and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus diseases on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

# Farm Notes for October.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop, to which our readers are referred.

## CLIMATOLOGICAL TABLE—JULY, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. Means. Max. | Means. Min. | Extremes. Max. | Date. | Min. | Date. | Rainfall. Total. | Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| *Coastal.* | | | | | | | | | |
| Cooktown .. .. | 29·99 | 80 | 67 | 85 | 29 | 59 | 27 | 74 | 6 |
| Herberton .. .. | .. | 71 | 53 | 79 | 13 | 38 | 30 | 112 | 5 |
| Rockhampton .. .. | 30·06 | 70 | 55 | 79 | 14 | 44 | 31 | 1,952 | 13 |
| Brisbane .. .. | 30·10 | 68 | 52 | 74 | 7 | 40 | 19 | 324 | 10 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. | 30·12 | 65 | 44 | 75 | 13 | 27 | 19 | 257 | 9 |
| Stanthorpe .. .. | .. | 58 | 38 | 65 | 6, 7, 8 | 19 | 19 | 241 | 12 |
| Toowoomba .. .. | .. | 60 | 43 | 71 | 12 | 29 | 19 | 554 | 9 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·97 | 81 | 55 | 88 | 13, 14 | 38 | 26 | 3 | 2 |
| Longreach .. .. | 30·07 | 68 | 47 | 78 | 1 | 40 | 19, 21 | 410 | 9 |
| Mitchell .. .. | 30·11 | 62 | 45 | 72 | 7, 13 | 32 | 19, 22 | 592 | 11 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 30·01 | 79 | 56 | 86 | 7, 13 | 43 | 10 | 0 | 0 |
| Boulia .. .. | 30·08 | 70 | 45 | 79 | 12 | 35 | 27, 28 | 6 | 1 |
| Thargomindah .. .. | 30·10 | 66 | 46 | 78 | 12 | 34 | 31 | 9 | 2 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JULY, 1933 AND 1932, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. July. | No. of Years' Records. | Total Rainfall. July, 1933. | July, 1932. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 1·00 | 32 | 0·94 | 1·33 |
| Cairns .. .. | 1·58 | 51 | 0·58 | 1·42 |
| Cardwell .. .. | 1·34 | 61 | 3·18 | 0·71 |
| Cooktown .. .. | 0·97 | 57 | 0·74 | 0·65 |
| Herberton .. .. | 0·84 | 47 | 1·12 | 0·92 |
| Ingham .. .. | 1·48 | 41 | 3·24 | 1·00 |
| Innisfail .. .. | 4·61 | 52 | 4·08 | 4·07 |
| Mossman Mill .. | 1·23 | 20 | 1·23 | 0·61 |
| Townsville .. .. | 0·60 | 62 | 1·27 | 0 |
| *Centra Coast.* | | | | |
| Ayr .. .. | 0·66 | 46 | 2·07 | 0·08 |
| Bowen .. .. | 0·89 | 62 | 5·19 | 0·40 |
| Charters Towers .. | 0·61 | 51 | 1·53 | 0 |
| Mackay .. .. | 1·59 | 62 | 10·08 | 0·52 |
| Proserpine .. .. | 1·33 | 30 | 9·29 | 0·70 |
| St. Lawrence .. | 1·23 | 62 | 11·38 | 0·19 |
| *South Coast.* | | | | |
| Biggenden .. .. | 1·28 | 34 | 3·61 | 0·30 |
| Bundaberg .. .. | 1·75 | 50 | 4·33 | 0·49 |
| Brisbane .. .. | 2·21 | 82 | 3·24 | 0·27 |
| Caboolture .. .. | 2·09 | 46 | 4·39 | 0·35 |
| Childers .. .. | 1·61 | 38 | 3·94 | 0·08 |
| Crohamhurst .. | 2·79 | 40 | 6·39 | 0·61 |
| Esk .. .. | 1·93 | 46 | 3·14 | 0·44 |
| Gayndah .. .. | 1·42 | 62 | 3·71 | 0·45 |
| Gympie .. .. | 2·08 | 63 | 3·60 | 0·43 |
| Kilkivan .. .. | 1·58 | 54 | 3·03 | 0·41 |
| Maryborough .. | 1·82 | 61 | 3·30 | 0·21 |
| Nambour .. .. | 2·58 | 37 | 5·10 | 0·40 |
| Nanango .. .. | 1·63 | 51 | 2·27 | 0·75 |
| Rockhampton .. | 1·48 | 62 | 19·52 | 0·25 |
| Woodford .. .. | 2·30 | 46 | 4·70 | 0·36 |

| Divisions and Stations. | Average Rainfall. July. | No. of Years' Records. | Total Rainfall. July, 1933. | July, 1932. |
|---|---|---|---|---|
| *Central Highlands.* | In. | | In. | In. |
| Clermont .. .. | 0·92 | 62 | 6·82 | 0·05 |
| Gindie .. .. | 0·87 | 34 | .. | 0 |
| Springsure .. .. | 1·04 | 64 | 9·63 | 0·13 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 1·71 | 63 | 2·57 | 0·97 |
| Emu Vale .. .. | 1·54 | 37 | 1·97 | 1·20 |
| Hermitage .. .. | 1·69 | 27 | 2·46 | 1·44 |
| Jimbour .. .. | 1·51 | 45 | 2·46 | 0·65 |
| Miles .. .. | 1·59 | 48 | 3·25 | 0·65 |
| Stanthorpe .. | 2·01 | 60 | 2·41 | 1·00 |
| Toowoomba .. | 2·02 | 61 | 5·53 | 1·14 |
| Warwick .. .. | 1·81 | 68 | 2·54 | 1·71 |
| *Maranoa.* | | | | |
| Roma .. .. | 1·41 | 59 | 5·04 | 0·53 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 1·26 | 19 | 4·61 | 0·39 |
| Gatton College .. | 1·32 | 34 | 2·91 | 0·64 |
| Kairi .. .. | 1·12 | 19 | 1·05 | 0·78 |
| Mackay Sugar Experiment Station | 1·33 | 36 | 9·64 | 0·37 |

GEORGE G. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

| | September. 1933. | | October. 1933. | | MOONRISE. Sept. 1933. | MOONRISE. Oct. 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | p.m. | p.m. |
| 1 | 6·7 | 5·37 | 5·33 | 5·51 | 2·24 | 3·30 |
| 2 | 6·6 | 5·37 | 5·32 | 5·52 | 3·33 | 4·29 |
| 3 | 6·5 | 5·38 | 5·31 | 5·52 | 4·39 | 5·28 |
| 4 | 6·4 | 5·38 | 5·30 | 5·53 | 5·42 | 6·26 |
| 5 | 6·3 | 5·39 | 5·28 | 5·53 | 6·42 | 7·24 |
| 6 | 6·2 | 5·39 | 5·27 | 5·54 | 7·41 | 8·23 |
| 7 | 6·1 | 5·40 | 5·26 | 5·54 | 8·39 | 9·20 |
| 8 | 6·0 | 5·40 | 5·25 | 5·55 | 9·38 | 10·15 |
| 9 | 5·58 | 5·41 | 5·24 | 5·55 | 10·35 | 11·9 |
| 10 | 5·57 | 5·41 | 5·23 | 5·56 | 11·35 | 12·0 |
| | | | | | a.m. | a.m. |
| 11 | 5·56 | 5·42 | 5·22 | 5·56 | .. | .. |
| 12 | 5·55 | 5·42 | 5·21 | 5·57 | 12·25 | 12·45 |
| 13 | 5·54 | 5·43 | 5·20 | 5·57 | 1·16 | 1·29 |
| 14 | 5·52 | 5·43 | 5·19 | 5·58 | 2·7 | 2·5 |
| 15 | 5·51 | 5·44 | 5·18 | 5·58 | 2·51 | 2·39 |
| 16 | 5·50 | 5·44 | 5·17 | 5·59 | 3·32 | 3·9 |
| 17 | 5·49 | 5·44 | 5·16 | 5·59 | 4·8 | 3·40 |
| 18 | 5·48 | 5·45 | 5·15 | 6·0 | 4·40 | 4·12 |
| 19 | 5·47 | 5·45 | 5·14 | 6·1 | 5·11 | 4·45 |
| 20 | 5·46 | 5·46 | 5·13 | 6·1 | 5·43 | 5·23 |
| 21 | 5·44 | 5·46 | 5·11 | 6·2 | 6·15 | 6·5 |
| 22 | 5·43 | 5·47 | 5·10 | 6·3 | 6·48 | 6·57 |
| 23 | 5·42 | 5·47 | 5·9 | 6·3 | 7·25 | 7·58 |
| 24 | 5·41 | 5·47 | 5·8 | 6·4 | 8·11 | 9·2 |
| 25 | 5·40 | 5·48 | 5·7 | 6·4 | 9·4 | 10·8 |
| 26 | 5·38 | 5·48 | 5·6 | 6·5 | 10·5 | 11·14 |
| | | | | | | p.m. |
| 27 | 5·37 | 5·49 | 5·5 | 6·6 | 11·9 | 12·19 |
| 28 | 5.36 | 5·49 | 5·5 | 6·7 | 12·15 | 1·22 |
| | | | | | p.m. | |
| 29 | 5·35 | 5·50 | 5·4 | 6·7 | 1·21 | 2·22 |
| 30 | 5·34 | 5·50 | 5·4 | 6·8 | 2·27 | 3·20 |
| 31 | | | 5·3 | 6·9 | | 4·16 |

## Phases of the Moon, Occultations, &c.

4 Sept. ○ Full Moon 3 4 p.m.
12 ,, ☽ Last Quarter 7 30 a.m.
20 ,, ● New Moon 4 20 a.m.
27 ,, ☾ First Quarter 1 36 a.m.

Apogee, 12th September, at 7.6 p.m.
Perigee, 25th September, at 8.30 p.m.

The Cross will be upright about 4 p.m. on the 1st, and about 3 p.m. on the 15th, reaching position III. about 10 p.m. on the 1st and 9 p.m. on the 15th, it will then be in an almost horizontal position, about 30 degrees west of the south celestial pole.

The occultation of Saturn by the Moon on the 2nd will take place long after they have set.

Before the Moon sets on the 2nd, Saturn may be seen a little more to the east, but it will be overtaken and passed at 11 a.m.

As Neptune will be in conjunction with the Sun on the 2nd, it will be more than usually invisible.

Mercury will be passing from west to east of Neptune on the 7th, about 4 p.m.

When the Moon passes Uranus, about 6 a.m. on the 8th, there will be an apparent distance of 6 degrees between them.

On the 11th, Mercury will be on the far side of its orbit, in conjunction with the Sun. Its distance from the Earth will be 127,496,780 miles.

On the 19th, Mercury will appear to be only 3 minutes south of Jupiter, from west to east of which it will apparently be passing.

Jupiter will be only 4 degrees north of the Moon at the time of setting, at 6.11 p.m. on the 20th.

On the 23rd the Sun will be passing from the north to the south side of the equator and the Equinox will occur. At 10 p.m. the sun will be exactly half-way round the sky from the First Point of Aries. It will then be technically entering the Sign of Libra, though for a month longer it will still be in the constellation Virgo.

A conjunction of Jupiter and the Sun will occur on the 27th, when the Sun, having overtaken Jupiter, will be passing from west to east of it, Jupiter then being entirely invisible.

The conjunction of Saturn with the Moon on the 29th, about 4 p.m., will be an interesting daylight object, requiring binoculars or telescope.

Mercury rises 26 minutes before the Sun on 1st September, and 12 minutes before it on the 15th.

Venus sets at 8.13 p.m. on the 1st, and at 8.34 p.m. on the 15th.

Mars sets at 9.51 p.m. on the 1st, and at 9.41 p.m. on the 15th.

Jupiter sets at 7.7 p.m. on the 1st, and at 6.25 p.m. on the 15th.

4 Oct. ○ Full Moon 3 7 a.m.
12 ,, ☽ Last Quarter 2 45 a.m.
19 ,, ● New Moon 3 44 p.m.
26 ,, ☾ First Quarter 8 20 a.m.

Apogee, 10th October, at 2.54 p.m.
Perigee, 22nd October, at 10.24 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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# Event and Comment.

## Use More Wool.

THAT the wool industry is maintaining the solvency of Australia was the keynote of the speeches at the official opening of the Use More Wool Exhibition in the Brisbane Town Hall.

The Minister for Agriculture (Hon. Frank W. Bulcock) in declaring the exhibition open, said it was obvious that a much greater volume of wool could be used in Queensland and Australia. Less than 6 per cent. of the total production of Australian wool was used in the Commonwealth. Research had indicated that clothing made of wool possessed merits far surpassing those of any other material, and that fabrics for house-furnishings made of wool were equally as aesthetic as those made of any other substance.

The appeal to use more wool should be irresistible to those people who considered that Australia should utilise her resources to the full, said Mr. Bulcock. At present the woolgrowers were maintaining the solvency of the Commonwealth.

It was a paradox that Australia, though producing the best wool in the world, was purchasing woollen goods from other countries. In the light of the serious unemployment problem the position was absurd. Unemployment had been greatly aggravated by the low values fixed by foreign buyers for Australian wool. At present, owing to the small local consumption, Australia was able to exercise very little influence on the world's tariff for raw wool.

''I visualise the day that must come, sooner or later, when, instead of exporting our wool, we will manufacture it, and merchants from other parts of the world will be purchasing our finished fabrics,'' said Mr. Bulcock.

The injunction to use more wool was a wise one. In that way the industry could be expanded, and the foundations laid for greater national security. The creation of a wool consciousness was a very laudable aim.

The exhibition demonstrated that Australians were capable of the same artistry in the manufacture of woollen goods as the people of older countries, he concluded. The products of the Ipswich woollen mills had attained a standard of excellence comparable with that of any other country.

## Women and Wool.

WOOL is a primitive necessity, a fact often overlooked in our changing world. Humanity has shifted its relative demands from the prime necessities of life—food, clothing, and housing—towards goods which satisfy secondary and, perhaps, more refined needs. Consumers in general are turning in each category of goods they use, from the coarser to finer qualities. Brown bread has been replaced by white, cereal foods by meat and other animal products, and cottons and woollens by silk and furs.

The wool production of the world to-day is only slightly greater than it was fifteen years ago, but silk has practically doubled, and artificial silk has increased tenfold. It will be seen, therefore, how these changing tastes or fashions have affected the demand for our wool and how greatly that lessened demand has reacted against our great staple industry, the properity of which means so much to us in our export trade.

With world production of all fibres steadily increasing competition is becoming intensified. And what has been the effect of this competition? We all know the amount of substitution that has taken place, how wool has been displaced by artificial fibres in the hosiery industry, how cotton and wool have yielded to silk in the woman's wardrobe.

Intense competition has enabled artificial silk and other manufactured fibres to be placed on more than favourable terms with wool. A study of consumption figures is interesting. Owing to the increased use of furs and silk and other fabrics that women have been wearing in recent years, the annual consumption of wool has markedly decreased. This statement has been challenged, however, by some authorities, but undoubtedly city women are using considerably less wool than formerly. To some extent, men are also using less in ordinary wear, though this is counteracted by a big expansion in the demand for such articles as sweaters, golf stockings, and bathing togs, due to an increasing interest in outdoor life.

In the present situation, the wool industry requires to anticipate developments and the discovery of ways and means of turning them to advantage. It is essential, for example, to find out through what means the large and steadily increasing aggregate consumption of textile fibres is growing. Such research carries one into the field, not without a feeling of trepidation, of current changes in feminine fashions. Here some remarkable data are met with. Although, for instance, there has been much written and said to the effect that the most serious trouble for the textile industry came from the trend towards fewer and fewer clothes on the part of women, a close study of the position shows that there is no room for very much pessimism. There is a current revolution in style, that one cannot help noticing in a lunch hour stroll down Queen street, which tends to offset this downward trend.

But the most important fact is that, although the average woman's everyday dressing represents but a fraction as many yards of material as her mother's or grandmother's, yet the number of garments in the wardrobe of women of all classes is far greater than those of women of the wealthier classes alone a generation or two ago. Along with lighter and less cumbersome clothing have been lower prices as a result of increasing production. The average woman wears less, and buys more, but, unfortunately, from the wool man's point of view, new synthetic fibres make up much of the additional purchases.

If an opinion may be risked on a subject in which mere man must display some courage in discussing (or is it just foolhardiness?), one of the most important opportunities for the wool industry through aggressive measures lies in intenser development, or extension of a demand for wool in women's wear. A further cultivation of the possibilities of the industry would make woollen materials more attractive from a dressmaking standpoint, but actually more desirable than materials made from the strongly competing fibres.

Wool consumption would increase greatly as the result of such an effort if well directed. It is a matter of style, of course, let alone comfort, but we are afraid style will be considered the more important. One lady of our acquaintance, for example, told us the other day that she would cheerfully wear a sujee bag if it were in the fashion.

As a matter of fact, in Europe wool is now worn much more than formerly, and in Paris woollen fabrics are as chic and smart as those of silk or cotton. French and English women wear much more wool than American women, and there is no reason why Australian women, especially as wool is one of the most important factors in the economy of the Commonwealth and successful wool marketing has become

such a serious matter, should not follow such an excellent example. Any bias against woollen materials is simply an idiosyncrasy. It is utterly indefensible on the grounds of comfort, fashion, or economy. What is required in all these things is careful education in the value, both hygienically and economically, of the home-grown product.

One of the best means of serving Australia at the present time is to wear more wool.

## The Cotton Planting Campaign.

THE planting season for cotton in the areas south of Mackay ranges from the end of September to December, with the first half of October as the best period. The later the planting the more danger there is of experiencing attacks of various insect pests. North of Mackay where the lighter rainfall belts exist, the same planting period should also be considered, particularly on the poor soils of the tobacco districts. In the heavier rainfall areas, the best results have been obtained from plantings made in late February. Such sowings develop under a tapering off rainfall, and thus mature their crops in the drier winter months. Plantings should be at the rate of 10 lb. delinted seed for new burns in the scrub; 12 to 15 lb. delinted and 15 to 20 lb. undelinted for the cultivations. Row spacings of 4 feet 6 inches are generally used, and the plants are thinned out when 5 to 6 inches tall to distances of 1 to 2 feet, according to soils and the season. The crops usually require from five to six months from planting before being ready for harvesting, which extends over another three to five months, depending on the climatic conditions. In the crop planting tables, published in our last issue, some obsolete information on the time of sowing and seed requirements was inadvertently included. The foregoing will, however, correct any misunderstanding that may have been conveyed as to cotton crop requirements in Queensland.

# CROWN LAND FOR NEW GRAZING SETTLEMENT.

## HUGHENDEN DISTRICT.

Hamilton Downs and Manuka Resumptions are to be open for Grazing Homestead Selection at the Land Office, Hughenden, on Thursday, 7th December, 1933, at 11 a.m.

Portion 4, parish of Urania, being an area resumed from the western part of Hamilton Downs Holding, is situated about 48 miles south from Maxwelton Railway Station.

Area is 25,053 acres.

Rent, 1¾d. per acre for first seven years.

Portions 3, parish of Manuka, and 6, parish of Corfield, being the area resumed from the western part of Manuka Holding, are situated on both sides of the Hughenden-Winton Railway between Corfield and Olio Railway Stations.

Areas, 25,294 acres and 23,913 acres, respectively.

Rent, 2d. per acre for first seven years.

Term of lease in each case, twenty-eight years.

Each selection must be stocked with sheep to its reasonable carrying capacity within a period of three years, and proof must be furnished of the financial standing and pastoral or land experience of the applicant.

## GOONDIWINDI DISTRICT.

Billa Billa lands are to be opened for Prickly-pear Development Grazing Homestead Selection at the Land Office, Goondiwindi, on Thursday, 23rd November, 1933, at 11 a.m.

Portions 1 and 3, parish of Billa Billa, 4 and 5, parish of Calingunee, 4 and 5, parish of Nomby, and 3, parish of Weir, situated on Yarrill and Billa Billa Creeks, from 18 to 27 miles north of Goondiwindi.

Areas from 11,700 acres to 16,000 acres.

Rent in each case ⅝d. per acre for first fourteen years.

Each selection must be enclosed with a rabbit-proof and marsupial-proof fence during the first three years, and will be subject to prickly-pear clearing and developmental conditions.

Free lithographs and full particulars of these lands may be obtained from the Land Settlement Inquiry Office, Brisbane, the Land Agents at Hughenden and Goondiwindi, and the Government Intelligence and Tourist Bureau, Sydney.

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

BY EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

### GREYBACK COCKCHAFERS LYING IN PUPAL CELLS.

October is the earliest month in which it is possible for a first brood of beetles (primary emergence of the season) to escape from the soil. Such undue appearances, however, rarely happen, two instances only having occurred during the last twenty years. In order to bring about an emergence of this nature, the beetles of the preceding year would need to have taken to wing early in November, and to have assumed the pupal state the following June, under exceptionally favourable climatic conditions.

The life-cycle of the pupa occupies a period of about five weeks, an additional three or four being passed by these beetles in their subterranean pupal chambers. Time is thus afforded for the outer casing of the beetle to become rigid and horny enough to resist contraction of the internal muscles required to operate movements of the powerful legs and wings of the mature cockchafer.

The plate for October shows a little more evidence of movement than was apparent during September, more than 50 per cent. of the beetles having now appeared in their resting cells to complete maturity and await ultimate release when rain has softened the earth overhead. A lately transformed pupa is seen in another chamber, and above that a set carrying cane sticks for next season's crop.

#### Trap-trees for Beetles.

Amongst the various methods of combating grey-back cane-beetles—that of collecting them from suitable trap-trees—deserves serious consideration, and should in certain cases be practised by individual farmers. On selections, for instance, where these cockchafers habitually invade the cane areas from near-lying belts of forest land, a number of such trees could with advantage be planted on headlands nearest to this timbered country. The best tree to use for this purpose is the well-known "weeping fig," which has recently been found to be most attractive of all the various food-plants of the grey-back, and appears to be specially adapted for such control work. It can be grown from seed, from cuttings, root grafts, or layered twigs; and after reaching a height of about 6 ft., rapidly makes a big tree, being very hardy and well suited to tropical conditions.

These figs could be planted about a quarter of a mile apart, starting from corners of the headlands needing protection. When of suitable size, the heads should be pruned in such manner as to induce a low and spreading growth of convenient height for collecting.

### Make Arrangements for Fumigation Work.

During October cane farmers should arrange to secure the services later on of reliable men for carrying out the work of fumigating grub-infested land at the proper time. It is needless to state that the chief qualification for this class of field work is conscientiousness, and such desirable men should never be hurried, but allowed time to do the work to their own satisfaction.

### Inspection of Hand-injectors.

Hand-injectors should now be overhauled, and all washers closely examined. It will be found a good plan to cut a number of duplicates of those washers which are liable to give trouble or get out of order when fumigation work is in full swing, and delays caused by such replacements prove inconvenient and mean loss of valuable time. It would be well to have duplicates on hand of washers G. X. S. L. V. (see illustration of section of hand injector published in last month's notes).

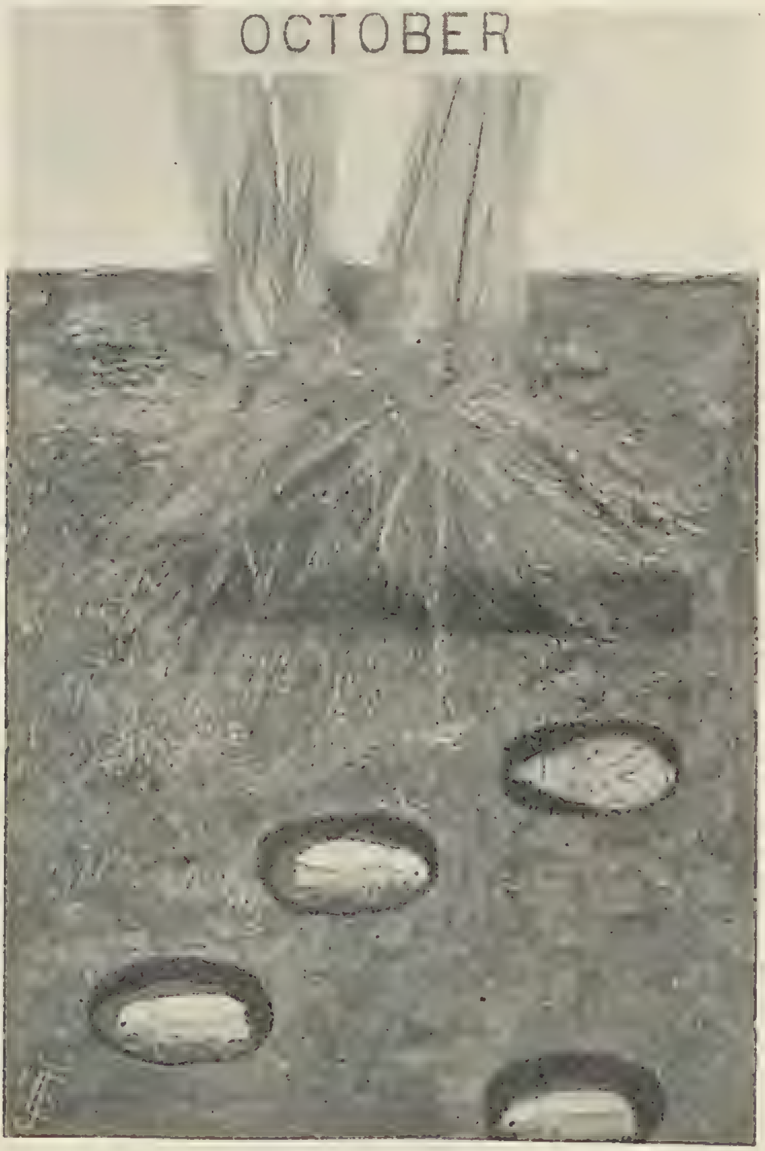


Plate 85.—Greyback Cockchafers in pupal cells waiting for rain to soften the ground and allow them to reach the surface. The fourth cell contains a pupa.

# Fruit Fly Control in the Stanthorpe District.

By HUBERT JARVIS, Entomologist.

DURING last season the fruit fly caused very considerable losses in the Stanthorpe district, and it is accordingly absolutely essential that a special effort be made to control this pest during the approaching season, otherwise the district will be faced with the strong probability of further and increasingly serious losses.

All fruitgrowers are therefore strongly urged to loyally support the control campaign, because, in order to achieve the desired satisfactory results, it must have the wholehearted backing of every orchardist in the Granite Belt. Provided the measures advocated in the following paragraphs are adopted and efficiently carried out in every orchard, there should be very little loss from fruit fly.

There are at present only two known methods of proved value for the control of the Queensland fruit fly. These are the gathering and safe disposal of all waste and infested fruit and the trapping of the fruit flies by means of a lure.

## Luring.

Individual orchardists have for years obtained excellent results by luring, and what is now required is that all growers in the Stanthorpe district shall lure consistently in order to give this control measure a really fair trial, and thereby prove to themselves what can be accomplished by it.

All growers are accordingly asked to set as many traps as possible, but not less than ten, on 15th October, baiting them with the Jarvis or Harvey lure, and to continue trapping, if possible, throughout the season.

Traps should be rebaited weekly, and if the traps are much soiled they should be cleaned out before rebaiting.

The formula for a five-to-one strength of the Jarvis lure is five tablespoonfuls of liquid household ammonia, five teaspoonfuls of imitation vanilla essence, and twenty-six ounces of water (one wine bottle full). In setting the traps one eggcupful of the lure prepared according to the formula just given should be added to five eggcupfuls of water, and this will give just the right amount of bait for one trap.

Fruit flies are generally found in the wettest or most sheltered portion of an orchard, and they have a fancy for particular trees, in which they congregate. Hence it is incumbent on the grower to find the best trapping trees by shifting the traps about. Large leafy trees are generally the best for trapping, and the traps should always be set in the shadiest parts of the trees.

The traps should be hung by means of tie wire or stout string, and they should hang as level as possible.

Growers should not be discouraged if they do not catch any flies for a week or so. This may be due to the fact that there are no flies about, especially early in the season. Persevere with this control measure, and remember that orchardists in Stanthorpe have fully demonstrated its value in past years, and, furthermore, that luring is an established control measure of proved value in other countries where fruit-fly infestation has to be combated.

### Disposal of Waste and Infested Fruit.

It is generally recognised that the gathering and destruction of all waste and infested fruit is of the utmost importance in fruit-fly control. Unless this measure is conscientiously carried out there is little hope of effectively controlling fruit fly.

Hitherto the destruction of waste and infested fruit has usually been accomplished by boiling, burning, burying, or immersing in water. None of these measures have given entire satisfaction, and all involve a great deal of labour. Hence it is now considered that the pit method is the most satisfactory manner in which to dispose of such fruit.

After the fruit is tipped into the pit it quickly commences to ferment, thus killing any fruit-fly maggots that may be present in the fruit.

A convenient size for the pit is about 6 feet by 5 feet, the depth being not less than 20 feet.

A suitable cover should be made for the pit. This can be built of hardwood boards or logs, and in either case an opening about 14 inches square must be left in the centre through which to dump the fruit. Inside this opening there should be nailed a sort of box combing made of hardwood boards 6 inches by 1 inch, and this should project about 4 inches above the cover, forming a sort of hatchway, over which a wooden lid can easily be fitted. If logs are used as a cover or there are spaces between the boards, the cover should be banked over with earth right up to the hatchway or opening. This will make all secure. The pit should be dug somewhere handy to the packing shed, as this will save unnecessary carting.

A pit such as that described will last for years and save no end of worry about disposing of waste and infested fruit. It certainly affords the most satisfactory method of disposing of such fruit.

### Summary.

Luring from the middle of October, continued throughout the season, combined with the dumping of waste and infested fruit in a sealed pit, will control the fruit fly. Growers in the Stanthorpe district are, therefore, strongly urged to adopt these control measures, otherwise they will inevitably be faced with a repetition of last year's serious losses.

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# Two Insect Enemies of Nut Grass.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

ABOUT thirty years ago nut grass (*Cyperus rotundus*) growing in the Singleton district of New South Wales was recorded as being attacked by a species of Coccidæ, the family to which the well known scale insects belong. The insect was credited with inflicting serious injury to its host plant. It was realised that if this were so the Coccid in question might prove of great value as a means of controlling the spread of the "grass," and consideration was given to its introduction to Queensland. Mr. Henry Tryon, then Government Entomologist, drew attention to the possibility of the insect attacking other plants, and advised caution until more was known of its habits. As a result of this warning it was some years before the insect, *Antonina australis* as it was named, was brought to this State, in which it was first liberated in 1910 in the Bundaberg district. Since that time it has been distributed over most of the coastal areas where nut grass occurs in any quantity. It is stated that it was taken as far north as the Herbert River, and Gayndah is the furthest place west at which it has been found.

Owing to the frequency with which nut grass control inquiries are received by the Department and the very different reports as to the effectiveness of its insect enemy, the writer was instructed by the Chief Entomologist, Mr. Robert Veitch, to make observations with a view to determining the value of the Coccid as a means of controlling nut grass, and also to discover if possible whether any plants of economic value are liable to be attacked.

The work was carried out chiefly at Brisbane, Bald Hills, Gatton, and Bundaberg, but observations were also made at such other places as have from time to time been visited in connection with other investigations.

### Feeding Habits of the Nut Grass Coccid.

The Coccid feeds entirely by sucking the sap of the host plant, and is subterranean in habits. Its feeding is mainly confined to the nuts, but quite frequently it is found on the ordinary roots and more rarely at the base of the stalk. As will be mentioned later, there is also a species of mealy bug on the "grass" which is found practically always on the base of the stalk.

The amount of injury which the plant sustains varies very greatly and appears to depend entirely on the nature and condition of the soil.

### Field Observations on the Coccid.

A colony of the Coccid was established in a rather heavy black soil garden in Brisbane. The plot was not disturbed but was occasionally watered when the surrounding lawns required water. After a little more than twelve months it was found that, though the insect had undoubtedly increased in numbers, the nut grass was very healthy, and had certainly not diminished in quantity.

At Bald Hills two small plots were established about fifteen feet apart on the headland of a cultivation paddock. Here the spread was very slow, and in about nine months some of the nut grass between the plots was quite free from attack. The "grass" throughout continued to thrive. This observation was made during a rather wet season, and the soil was constantly very moist for about the first two of the nine months.

Probably the most conclusive evidence was obtained at Bundaberg. At Pemberton and Rubyana in that district observations were made at places where the Coccid had been present for at least twelve, and probably not less than fifteen, years. In one plot, which for many years had been left untended owing to the presence of the nut grass, there was an abundance of the Coccid, but the nut grass was growing luxuriantly. This was on a heavy red soil which would hold the moisture well. Some few miles from this, where the insect had been working for a period of more than ten years, a cultivated plot was examined. Here the Coccid was healthy and plentiful as also was its host plant. The soil was well worked, but again it was of good moisture-retaining nature. On the side of a hill a few hundred yards away the insect was again located. It appeared to have migrated there without contemplated human assistance. In this case the nut grass was in very poor health, and from all the evidence that could be gathered the Coccid seemed to be responsible to a very large extent. This was again in cultivation, but the soil was much lighter and had less moisture-retaining possibilities.

The facts indicated by these plots were confirmed by observations at other places, notably at Gatton, where on moist soil the "grass" was thriving, while on dry soil the insect appeared to be doing good work.

At Bundaberg a plot was examined a few weeks after some very heavy rain, which had resulted in the ground being covered with water for about twenty-four hours. Just prior to the wet weather a colony of the insect had been obtained from the plot, but after the submergence no living Coccids could be found in the soil. Mr. R. W. Mungomery, Assistant Entomologist of the Bureau of Sugar Experiment Stations, who co-operated in the search, stated that he had previously had a similar experience with another plot.

All the evidence obtained pointed to the fact that the insect does not withstand any great amount of free water in the soil, whilst under ordinary moist conditions in the soil its effectiveness is greatly reduced.

### No Host Plants other than Nut Grass.

It is rather peculiar that the optimum conditions for the insect and host plant differ so widely, and it rather suggests that nut grass is not the only or original host of *Antonina australis*. Nut grass, of course, is not a true grass at all but is a sedge belonging, botanically, to the family Cyperaceæ. Search has been made on such other Cyperaceous plants, as have from time to time been found, but so far no trace of the insect has been found on them. Again, it must be remembered that sedges, as a family, are usually found growing under soil conditions which, from the observations recorded above, would be unfavourable to the Coccid.

This and other considerations made the examination of certain plants, more particularly grasses, very necessary. Accordingly a search was made on several species of grass of economic importance; Couch, Rhodes, Buffalo, and Paspalum grasses, and sugar-cane, were examined in many localities. As a result of this search Coccids of the genus *Antonina* were found feeding on Couch and Rhodes grasses and dahlia bulbs. After a thorough examination the writer was not satisfied that these were the same species as the nut grass Coccid, but it was considered that a specialist on this group should be asked to decide the question. Accordingly specimens were sent to the British Museum, but no report has yet been received as to their actual identity, although a preliminary note suggests that the above conclusions are correct.

More recently, Mr. J. Harold Smith, Entomologist, working in North Queensland, has carried out some observations on the subterranean Coccidæ of those parts, and he has now expressed the opinion that *Kuwanina hillii* is the dominant and possibly the only species attacking the nut grass in the North.

Mr. Smith has further collected Coccids of the genus *Antonina* from Kikuyu, Rhodes, Couch, Summer, and Paspalum grasses and *Panicum muticum*. He states that all these appear to him to be of the one species, and it seems possible that they may be conspecific with the specimens mentioned above as having been obtained by the writer from Couch and Rhodes grasses in southern localities.

In the meantime experiments were carried out with a view to discovering whether or not the insects would survive an interchange of host plants. These experiments all gave negative results; that is to say, insects transferred from nut grass to Rhodes and Couch, and *Antonina* from Rhodes and Couch, placed on nut grass all died within a few weeks. However, it would be necessary to repeat and extend this work before arriving at a quite definite conclusion.

Evidence in support of this last result was obtained at Bundaberg. In an untended plot nut grass, Rhodes, Johnston, and Couch grasses and sugar-cane were found growing with their roots in close proximity to each other. The nut grass Coccid had been present in the patch for a number of years, and was infesting the nut grass fairly heavily. All the other species were quite free of the insect.

## Nut Grass Mealy Bug.

In addition to *Antonina australis* a species of mealy bug has frequently been found feeding on nut grass. This insect, though somewhat closely related to the *Antonina,* belongs to a different genus. The two insects can be readily distinguished as the adult *Antonina* is legless and rounded in form, while the other is elongate and has well developed legs. In all stages the secretion of the *Antonina* is much the less floury. It may be said that there is no evidence that the mealy bug causes any greater injury to the "grass" than does the other insect. The two species are frequently found on the one plant. Indeed, nut grass growing under roadside trees in Brisbane in only moderately heavy soil was observed to be quite healthy over a period of two years, while heavily infested with both *Antonina* and the mealy bug.

### Note on Taxonomy.

It will be noted that no attempt has been made to name the mealy bug. The group of insects to which it belongs really requires a specialised knowledge, and so many differences of opinion occur among non-specialists and even specialists in the group with respect to identifications that it might be unwise to make an attempt. The vernacular name should suffice for the purposes of this article, particularly as the insect is not considered to be of any economic moment. For similar reasons the name *Antonina australis* has been followed, though, from some of the available literature, there seems a probability that this insect has been placed in the wrong genus. It can, however, be definitely stated that the insect is the one commonly referred to under this name. It is quite possible that the northern species determined by Mr. Smith as *Kuwanina hillii* Laing and the southern species referred to above as being doubtfully *Antonia australis* Green will be found on examination by specialists to be conspecific.

### Summary.

From the above data and evidence gathered from time to time by more general observations, it is considered that except under dry soil conditions *Antonina* has little if any value in controlling nut grass. The damage suffered by the "grass" is greatest in dry loose soils. Under such conditions the insect, especially if undisturbed, may be very detrimental to the health of the plant and thus considerably reduce or even prevent its spread. However, it is very doubtful indeed that *Antonina* alone would ever lead to the eradication of the pest. Cultivation has probably no effect on the insect, except in so far as it alters the moisture holding capacity of the soil, but certainly does help to promote the growth and spread of the "grass." If the plant be growing in a heavy soil under moist conditions, the insect has no controlling influence whatever.

Thus *Antonina* cannot be considered to be of any economic value, since its only really good work is accomplished in situations where nut grass would scarcely ever become a pest to the farmer. In so far as other host plants are concerned, the evidence is reassuring, but must not be taken as definite.

There is also no reason for thinking that the mealy bug is likely to be a limiting factor in the incidence or spread of the host plant.

**TO SUBSCRIBERS—IMPORTANT.**

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

# The Tobacco Beetle.*

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

THE entomological difficulties of the tobacco grower do not cease even when the leaf is bulked. Often the stored leaf is invaded by the tobacco beetle and the larvæ of the insect may effect a good deal of damage before the loss is detected and appropriate remedies applied.

The tobacco beetle, *Lasioderma serricorne* F., is a small hard-bodied insect, about one-tenth of an inch in length. The adults themselves are not particularly injurious, but the immature stages feed ravenously on the cured leaf. They are better known as pests of manufactured tobaccos, cigars, cigarettes, &c., but the grower is more concerned with their activity in bulked leaf held on the farm prior to its being sold. All stages occur in the bulks (Plate 86), eggs being laid on the leaf, larvæ burrowing amongst it, and pupation taking place in the debris which accumulates wherever the larvæ are active. Usually the pupæ are attached to a leaf surface enclosed in a cell, the walls of which are impregnated with leaf fragments and debris.

The life cycle requires some six to ten weeks for its completion, but the fertility rate is such that, if bulks are held on the farm for any length of time the injury may be extensive. Normally the leaf is sold within a few months of the completion of curing, but on most farms a certain amount is held over until the following year. This residual leaf may be a temporarily unsaleable variety for which the grower ultimately hopes to find a market. In North Queensland, the carry-over leaf comes from another source. In almost all bulks prior to grading there is some green leaf which is of no value to the manufacturer. The objectionable colour may often be removed by steam treatment, but in current practice it is usual to bulk these ''greens'' independently, for after a time the colour disappears and is replaced by a saleable mahogany. Such bulks of green leaf are stored in the shed until the following season, when they will be sold along with the new crop. In the meantime, they often become infested with the tobacco beetle, and when the newly-cured leaf is bulked in the same shed the adults rapidly invade the further accessible food supplies, and may cause a great deal of loss even in the limited period between the curing and the sale of the leaf. Outbreaks in the present season have invariably been traced to this source.

The control measures combine both preventive and remedial measures. As infestation in new bulks is initiated by insects in carry-over leaf, it is imperative that any one season's bulks should not be built in the same shed as older contaminated leaf. If the leaf taken from the flue-curing barn is bulked immediately in a perfectly clean shed, the risk of infestation is slight, at least, in the limited period before despatch to the manufacturer. If there is any doubt concerning the cleanliness of the bulk shed some form of fumigation should be carried out before

* Reprinted from ''Tobacco Growing in Queensland,'' by N. A. R. Pollock, J. Harold Smith, and L. F. Mandelson. Published by the Department of Agriculture and Stock, Brisbane, 18th May, 1933.

Plate 86.—The Tobacco Beetle (*Lasioderma serricorne* F.).
Damage to tobacco leaf.

introducing new leaf. Bulk sheds usually lend themselves to fumigation for they are compactly built and easily made airtight. All crevices should be packed with rags or some such material, and the building fumigated with carbon bisulphide. Carbon bisulphide is used at the rate of 5 lb. per 1,000 cubic feet, the fluid being poured into saucers previously placed high up in the bulk shed. This fumigant is inflammable and naked lights should not, therefore, be exposed in the vicinity of the sheds. Furthermore, the operator should take adequate precautions to avoid inhaling the vapour, as this fumigant is toxic to human beings. About thirty-six hours must elapse before the doors and windows are thrown open to allow the escape of the poisonous fumes.

When bulks are actually infested, drastic measures may be necessary to destroy the insects. The reactions of the tobacco beetle to heat have been studied in other countries, and it appears that temperatures of 140 to 150 degrees Fahr. are fatal to all stages of the insect if maintained for two hours. With the heating facilities available on the farm, the grower can thus rid his bulks of the pest. Infested bulks are broken down and the leaf transferred to an empty flue-curing barn. The fires are lit and the barn temperatures raised to 150 degrees Fahr. and kept at that level for two or three hours. If the bulks are thoroughly broken down the shorter period will be sufficient, but if only partly broken the three-hour treatment is preferable, as it allows time for the heat to penetrate the whole of the leaf. All the leaf in the contaminated bulk shed, even though some of it may not appear to be infested, should be treated, for some insects are almost certain to be present in the apparently free stocks. After being heated in the barn, the leaf should not be transferred to the original bulk shed until the building has been fumigated, otherwise any insects remaining after the first removal of the bulks will reinfest the leaf.

## GOOD MEN PASS.

In his annual report to Parliament, the Public Service Commissioner, Mr. J. D. Story, I.S.O., pays this graceful tribute to the memory of two notable public servants who passed hence in the course of the year:—

Alfred Halliwell Smith and George Andrew Ferguson passed with dramatic suddenness. Two good men are gone, and their loss is the more acutely felt as both were in the offing for even higher positions. Public Service administration takes unusually heavy toll just now. Apart from the stress and strain of the work, sensitive souls wince under present-day biting criticism—much of it baseless. Mr. Smith was a member of the new Bureau of Industry, and he gave promise of being one of its outstanding men. A meeting of one of the Bureau Committees was held shortly after his death. He had intended to submit certain proposals to that meeting. The proposals were good and had been prepared with that meticulous care and thoroughness characteristic of his work; it devolved upon another to present them. But the dead spoke, and the void was but intensified. Of George Ferguson, Anzac, it can be said that his memory will be cherished by many a widow, many a fatherless waif, and many a returned man—a tribute to his work and his worth which rings true.

# The Tomato "Green Fly" Association.

By D. O. ATHERTON, B.Sc., Assistant Entomologist.

IT would appear from previous records that the two species of this association always occur together on tomatoes, though the Jassid, *Empoasca sp.*, greatly outnumbers the Capsid, *Cyrtopeltis tenuis* Reut. This was confirmed in the winter of 1931, and the dominance of the Jassid clearly demonstrated. In the early part of the season at the end of April and during the month of May, considerable difficulty was experienced in locating the Capsid in the field, even when the Jassid was very much in evidence. As the season advanced the Capsid population steadily increased until at the end of September and during October numbers were present on all plants examined throughout the Bowen area. Owing to the fact that both the Jassid and Capsid almost invariably occur together on tomato plants in the Bowen district, a local practice of referring to them collectively as the "green fly" association has arisen.

## Nature of Injury.

Direct injury by the Jassid is practically confined to the leaf laminæ, though the fruit may be attacked occasionally. Indirect injury consists in the spotting of the fruit with excreta, and the blemishes thus formed must be removed by the use of a damp cloth before the fruit is shipped. Injury to the leaf results from the feeding habits of the Jassid, as the sap is drawn from a tiny roughly circular patch of the leaf lamina at each insertion of the proboscis. After a short time these areas dry out and become whitish in colour. The punctures are usually made in irregular double rows, but when the leaves are heavily infested all the chlorophyll, with the exception of that in close approximation to the midrib and main veins, may be destroyed. Leaves in the centre of the plant are normally more heavily infested than those towards the outside of the plant. In cases of severe injury the pest thus prevents elaboration of plant food in the leaves, and produces an unhealthy and distorted development which may result in the death of the plant.

In connection with the disintegration of chlorophyll in a small area of the lamina around the site of proboscis insertion, it is interesting to note that in a paper published in 1931 K. M. Smith cites various injuries caused by the feeding of certain Hemiptera or plant bugs. He raises the question of toxicity in salivary secretions of various plant bugs with respect to the tissue of their host plants; states that the saliva of Capsid bugs is generally remarkably toxic to plants; and gives this as one reason in his opinion why Capsids as a group are so little concerned with the transmission of virus diseases. Jassids are more commonly vectors of virus diseases, so that the dead white areas around their feeding punctures on tomatoes are possibly due to death from dessication or general mechanical injury rather than a direct chemical effect of the salivary secretions.

The feeding of the Capsid is apparently confined to the young growing shoots and fruit. The exact mode of attack has not yet been determined, but nymphs and adults have fed and lived for a week under observation on a leafless fruiting branch where the fruit were not in excess of 3/16 of an inch in diameter, and also have been successfully maintained on a young growing shoot which bore no fertilised flowers. All attempts to maintain nymphs and adults on the laminæ of matured leaves in the laboratory have failed, whereas all laboratory breeding of the Jassid was carried out in small moist chambers containing only mature leaves as food.

From these observations it is considered that the Jassid alone is responsible for the part played by the "green fly" association in the large vitality loss and "wragging out" of the central leaves from affected plants. Whether the Capsid may be associated with the phenomenon locally known as "blossom drop" still requires demonstration. The year 1931 was abnormal in that the Jassid was present in considerably greater numbers than usual, whereas the Capsid was less abundant. Therefore, it is just possible that subsequent investigations will not confirm the supreme importance of the Jassid in the "green fly" association indicated by the observations discussed herein.

## THE CAPSID.

The results from life history studies with this species, *Crytopeltis tenuis* Reut., were very disappointing, but are contained in the following meagre notes. Gravid females on dissection yielded from six to eight eggs per individual, but no eggs definitely attributable to the Capsid were collected in the field. The site of oviposition on the tomato plant has not been determined. Last-stage nymphs, when confined in the laboratory, lived up to four days before moulting to the adult stage. Adults when confined with adult Jassids have been observed feeding on the latter, which afterwards succumbed. This may have been an abnormal occurrence owing to the enforced proximity of the species in the laboratory. There is no evidence of the Capsid preying on the Jassid in the field.

## THE JASSID.

This species, *Empoasca sp.*, is considered more important as a pest than the Capsid, and accordingly has been treated in much greater detail.

During the existence of the temporary entomological station at Bowen from April to October, 1931, the Jassid was observed to breed continuously, but the numbers of individuals fluctuated considerably over this period. In April and early May, at the commencement of the season, these numbers were relatively low, but as the season progressed the degree of infestation increased until it reached a maximum during the latter part of July and throughout August. Following the maximum infestation there was a gradual decline of the Jassid population till the end of October, when observations ceased. A consideration of the major seasonal fluctuations of the tomato crop in conjunction with the foregoing statements will show that, accepting the district as an entity, there may be a positive correlation between the numbers of tomatoes produced and the numbers of Jassids present. This has the appearance of a paradoxical possibility, but nevertheless it probably rests on the fact that the greater the number of healthy well-grown plants—i.e., those producing quantities of marketable fruit—the greater will be the supportable Jassid population.

### Life History Stages.

The observations on life history were confined to a period extending from the latter part of May until the early part of August, 1931, and all figures necessarily refer to this period. At the conclusion of incubation, which may have lasted from ten days to a fortnight, the nymph forces its way out of the egg presumably through the incision in the leaf epidermis made by the female for the purpose of oviposition. The time occupied in emergence is fairly constant at ten minutes, and the nymph remains quiescent for a period ranging from five minutes to over half an hour before feeding commences. Newly hatched nymphs are, with the exception of dark red eyes, almost colourless or translucent, but before the end of the first instar they assume a light green colour which then persists throughout the five nymphal instars and the adult life of the insect. Except for a short time prior to each moult, active feeding continues throughout life. Observation indicates that those nymphs destined to produce females are slightly larger and pass more time in the nymphal stages than those from which males arise. For ten individuals bred through the nymphal stages in June, the average time passed as nymphs was little more than sixteen days, whereas for eight individuals reaching maturity towards the end of July the corresponding period was twenty days (Table I.). These notes indicate that the rate of development may be to some extent dependent on climatic conditions or more especially on prevailing temperatures.

The egg is approximately 0·8 mm. in length and about one-quarter of that in diameter. It is sausage shaped and is white in colour with a smooth shining chorion, but towards the close of the incubation period the red eye spots of the developing embryo become visible. The duration of the egg stage is from ten to fourteen days.

The first-stage nymph is about 0·8 mm. in length and almost colourless or translucent at first except for the red eyes, but towards the close of the instar it assumes a light green tinge. The habit of leaping, from which the popular name of "plant hoppers" is derived, is acquired within three hours of hatching, when the young insect is capable of jumping up to 2 inches into the air, about sixty times its own length. The duration of the first nymphal stage is from three to six days.

The second-stage nymph is about 1·2 mm. long with the colour as in the final stages of the previous instar. The wing buds have not yet appeared. The duration of the second nymphal stage is from two to five days.

The third-stage nymph is about 1·6 mm. in length, the eyes are red, and the remainder of the body a uniform light green colour. The wing buds are just evident as posterior lateral extensions of the meso- and meta-thoracic tergites. The duration of this stage is from one to five days.

The fourth stage nymph is about 2·2 mm. in length and coloured similarly to the previous stage, and there is a further development of the wing buds. The duration of the fourth nymphal stage is from two to four days.

The fifth-stage nymph is about 3·0 mm. in length, and except for the red eyes is uniformly light green in colour as are the previous instars. The wing buds are well developed and quite obvious outgrowths from the thorax. Feeding generally ceases some hours at least before the occurrence of the final moult. The duration of the fifth and final nymphal stage is from two to seven days.

## Oviposition.

A period of eleven to sixteen days passes after the female reaches maturity before the first eggs are laid. As far as can be deduced from the evidence collected during periodical dissections of gravid females, it would appear that from four to six eggs are matured at a time, but no indication of the total number of eggs laid during the life of the insect has been obtained. Occasionally oviposition takes place in tender slender growing stems, but eggs are far more generally laid in the leaves of the plant, often in the leaf stalk of the compound leaf or more usually in the veins and midrib of the leaflets, but they have never been found in the laminæ of leaves. Female genitalia are so modified that the egg is generally inserted into the tissues of the plant almost at right angles to the surface. After insertion the egg is completely covered by the epidermis of the leaf, and visible external evidence of its position is slight or absent. One observed female in the laboratory continued to lay eggs at intervals for over three weeks.

## Duration of Adult Life.

Several individuals lived as adults in the laboratory for a little over one month, and in one instance the total length of adult life was found to be six weeks.

## Varietal Susceptibility.

It is fairly generally accepted among growers that Bowen Buck-eye is more susceptible to the attacks of "green fly" than other varieties. This opinion is supported by field observations, during which it was generally found that Buck-eye plants growing in close proximity to those of other varieties carried much larger Jassid populations than the latter.

Further evidence in support of varietal susceptibility was obtained from a small laboratory trial described in a subsequent paragraph.

Two hypotheses have been advanced in an attempt to explain the above-mentioned susceptibility:—

I. Migration occurs between tomato plants in the field and between these and alternative weed host plants. Buck-eye, being more suited to the requirements of the Jassid, accumulates the greatest population per unit of foliage.

II. There is little migration, but multiplication is faster on Buck-eye than elsewhere.

Laboratory trials tended to show that the majority of adult Jassids when placed on Marglobe foliage migrated to that of Buck-eye, even when both were kept under equivalent conditions of moisture, temperature, and light. They also demonstrated that there is no appreciable difference in the total length of nymphal life irrespective of the variety used for food during breeding operations.

Thus it will be seen that there is no support for the second hypothesis, but the data just quoted indicates the probability of the first being correct.

### Other Host Plants.

This pest has been found to possess a very wide range of food plants, its alternative hosts embracing a number of orders, including Gramineæ. In fact, it appears that almost all plants of a herbaceous nature may serve as food for this omnivorous feeder. The following are plants on which all stages from egg to adult have been obtained:—Pigweed (*Portulacca spp.*); tar vine (*Boerhaavia diffusa*); beetroot (*Beta vulgaris*); carrot (*Daucus carota*); French bean (*Phaseolus vulgaris*); garden pea (*Pisum sativum*); tobacco (*Nicotiana tabacum*); potato (*Solanum tuberosum*); egg plant (*S. melongena*); night shade (*S. nigrum*).

Adults have also been collected from the following plants, which showed typical feeding punctures:—Wild spinach (*Amaranthus viridus*); cabbage (*Brassica oleracea*); lettuce (*Lactuca sativa*); sow thistle (*Sonchus oleraceus*); false mallow (*Malvastrum tricuspidatum*); star burr (*Acanthospermum hispidium*); sida retusa (*Sida cordifolia*); peanut (*Arachis hypogæa*); sorghum (*Sorghum vulgare*); maize (*Zea mais*); summer grass (*Panicum sanguinale*).

### Distribution.

The species is found in almost every agricultural area of the State, and in isolated years has been recorded as causing severe damage to tomatoes at Stanthorpe and to cotton in the Burnett on certain classes of soils. During normal years, however, the severity of its attacks in other districts rarely approaches that which it assumes on the tomato crops at Bowen.

Even in the adjacent districts of Proserpine and Ayr, though present on tomatoes and other crops, "green fly" seldom if ever reaches pest proportions, and even at Bowen there is neither seasonal nor regional regularity of infestation. These observations indicate considerable complexity in the factors which influence its incidence and present an interesting field of inquiry.

### Natural Enemies.

The evidence obtained during 1931 indicates two species of egg parasites as the only direct natural controls of any importance. The Mymarid parasite, *Anagrus armatus* Ashm. var. *australiensis* Gir., was comparatively rare, only seven individuals having been obtained from the many hundred Jassid eggs handled. The Trichogrammatid, *Aphelinoidea howardii* Gir., was much more plentiful, and a considerable number were obtained. One record shows that fifty-two Jassid nymphs and twenty three parasites came from the one lot of material, and thus indicates a 30 per cent. parasitism, if it is assumed that each egg produced either a nymph or a parasite. Despite this occasional heavy incidence of the parasite, its beneficial effects in the field were not apparent, and the Jassid infestation increased even in the locality from which the above-mentioned material was collected.

### Irrigation.

The observed effects of irrigation are sometimes remarkable and are worthy of more detailed consideration than has been possible in the

investigations at present under discussion. Tomatoes which have been planted early in the season usually decline rapidly under the combined effects of "green fly" and Fusarium wilt when irrigated at the bearing stage. On the other hand, tomatoes planted late in the season and irrigated regularly attain a luxuriant and prolific growth. Such plants appear more resistant to Fusarium wilt, and are able to support a very considerable Jassid population without evident deterioration for a number of weeks after harvesting begins. These observations were frequently verified by the experience of growers throughout the district.

## Control Experiments.

In a paper by De Long published in 1929, copper salts are claimed to be toxic when applied to the potato leaf hopper through the medium of Bordeaux mixture treated foliage, and experiments in support of the claim are described. Burgundy mixture is also listed as having this toxic property when applied in a similar manner.

Experiments with Burgundy mixture for the control of the Jassid under discussion were therefore initiated at Bowen, and an attempt was made to gather evidence on the subject. Burgundy mixture was used in preference to Bordeaux mixture because of the difficulty experienced in obtaining a standard quality of lime for the latter.

A block of fifty tomato plants in close proximity to large numbers of others was treated regularly every fortnight for two months with 4:5¼:40 Burgundy mixture. The effect on the plants, judging solely from field observations, tended to be deleterious rather than beneficial. The foliage was less luxuriant and harsher, and there was less fruit than in the case of unsprayed plants. There was no apparent effect on the Jassid, as normal feeding and reproduction continued throughout the period. For the purpose of making a supplementary test a leaf was well covered with newly made Burgundy mixture and confined in a glass tube 8 inches long by 2 inches in diameter. One end of the tube was closed with gauze, and the other, after the introduction of thirteen Jassids, closed by cotton-wool around the leaf petiole making connection with the living plant. At the expiration of five days examination disclosed no dead Jassids.

From these observations it would appear that Burgundy mixture has little insecticidal value against the Jassid on tomatoes, but the definite claims for Bordeaux mixture against a similar pest on potatoes warrant further investigation into this aspect of tomato pest control.

Dusting trials were initiated in April, 1931, and operations commenced with the selection of two experimental areas. One was set out in randomised plots for the accurate comparison of nicodust and ground sulphur as insecticides against the "green fly." The other was marked off into observation plots to roughly demonstrate the mass effects of certain treatments on the "green fly" population, on the general vigour, and on the fruit production of the plants. The treatments used were Burgundy mixture as a spray, and precipitated sulphur, ground sulphur, and nicodust applied as dusts.

The area set out in randomised plots comprised one acre of fairly uniform land, and was divided into nine plots of two rows each, the various plots being separated from each other by an untreated guard

row. The plots were taken in three groups of three each, thus giving three random replications of each of the three following treatments:—sulphur and nicodust applied as dusts.

The dusts were applied at fortnightly intervals from 30th April till 28th May, inclusive. On alternative weeks the whole of the area was dusted with 50 per cent. lead arsenate till 7th June. It was intended to continue these treatments for two months or until such time as the plots became unprofitable to pick. However, the climatic conditions became so unfavourable that the prospects of harvesting a crop completely disappeared, and after one month the collection of further data from the area was abandoned.

The area selected for observation plots comprised about half an acre of fairly uniform land, containing five rows with fifty plants per row. The area was divided into five successive plots, each containing a block of fifty plants, and the respective treatments allotted as follows:—Control, Burgundy mixture, precipitated sulphur, ground sulphur, and nicodust—the Burgundy mixture applied as a spray and the others as dusts. Applications were made at fortnightly intervals from 30th April till 9th July, inclusive, and on alternate weeks the whole area was dusted with 50 per cent. lead arsenate. Unfortunately, these plots suffered from the same unfavourable climatic conditions as those responsible for the failure of the other experiment, and although the treatments were continued for six weeks the collection of data was discontinued thereafter.

**Summary.**

Previous observations on the invariable association of the Jassid, *Empoasca* sp., and the Capsid, *Cyrtopeltis tenuis* Ruet., are confirmed. The mode of injury of the former is described and discussed, and it is considered that this species alone is responsible for the part played by insects in the large vitality loss and "wragging out" of the central leaves of the plants attacked. The theory that *C. tenuis* may be associated with the phenomenon locally known as "blossom drop" is advanced, but still requires demonstration.

Little information is available from the studies intended to elucidate the life history of the Capsid, but the life history of the Jassid is described in some detail. The theory that there may be some difference in varietal susceptibility of tomatoes with respect to the Jassid is supported by field observations and by a small laboratory trial. Alternative hosts are listed, and mention is made of the distribution and natural enemies of the Jassid.

Reference is made to the claim that copper salts, applied through the media of Bordeaux or Burgundy mixture and other fungicides, are toxic to leaf hoppers feeding on treated plants, and unsuccessful efforts to corroborate this claim are recorded. Control experiments with nicodust, ground sulphur, and precipitated sulphur, designed by Mr. J. Harold Smith, are described.

LITERATURE.

Smith, K. M. (1931).—"Biological Reviews," Vol. VI., Pt. 3.

De Long, D. M. (1929).—"The Role of Bordeaux Mixture as a Leafhopper Insecticide." Jour. Econ. Ento., Vol. 22, pp. 345-353.

TABLE I.

LIFE HISTORY OF JASSID.

| Date Eggs Laid. | Days—Duration of Egg and Nymphal Stages. | | | | | | | Sex. |
|---|---|---|---|---|---|---|---|---|
| | Egg. | I. | II. | III. | IV. | V. | Nymphal Total. | |
| 11 May, 1931 .. | 10 | 4 | 3 | 2 | 2 | 6 | 17 | ♀ |
| | 10 | 4 | 3 | 2 | 3 | 5 | 17 | ♂ |
| 16 May, 1931 .. | 10 | 3 | 2 | 1 | 4 | 4 | 14 | ♂ |
| | 10 | 5 | 3 | 2 | 3 | 3 | 16 | ♂ |
| 19 May, 1931 .. | 10 | 5 | 3 | 2 | 3 | 3 | 16 | ♂ |
| | 10 | 5 | 3 | 2 | 3 | 4 | 17 | ♀ |
| | 10 | 5 | 2 | 3 | 3 | 4 | 17 | ♀ |
| | 10 | 5 | 2 | 5 | 3 | 2 | 17 | ♀ |
| | 10 | 4 | 3 | 3 | 2 | 4 | 16 | ♂ |
| | 10 | 4 | 4 | 2 | 2 | 4 | 16 | ♂ |
| June average .. | 10 | 4·4 | 2·8 | 2·4 | 2·8 | 3·9 | 16·3 | |
| 20th June, 1931 .. | 10 | 3 | 2 | 4 | 3 | 7 | 19 | ♂ |
| | 10 | 3 | 5 | 4 | 4 | 5 | 21 | ♀ |
| | 10 | 3 | 2 | 4 | 2 | 5 | 16 | ♂ |
| 26th June, 1931 .. | 12 | 4 | 4 | 3 | 3 | 6 | 20 | ♀ |
| | 12 | 6 | 5 | 2 | 2 | 5 | 20 | ♂ |
| | 12 | 5 | 5 | 3 | 4 | 5 | 22 | ♂ |
| | 12 | 5 | 4 | 3 | 3 | 6 | 21 | ♀ |
| | 12 | 5 | 3 | 4 | 4 | 5 | 21 | ♂ |
| July average .. | 11·25 | 4·25 | 3·75 | 3·38 | 3·12 | 5·5 | 20 | |

NOTE.—June, total nymphal life of male averages .. .. .. 15·8 days
June, total nymphal life of female averages .. .. 17·0 days
July, total nymphal life of male averages .. .. .. 19·6 days
July, total nymphal life of female averages .. .. 20·66 days

## MUSTARD IN VETERINARY PRACTICE.

The circumstances in which mustard can be used in veterinary practice are essentially similar to those arising in human beings.

In the relief of local pain the mustard poultice or plaster is invaluable. The size of the poultice naturally depends on the size of the animal for which it is intended and also the area of the body affected. The poultice is prepared by making the mustard into a thin paste with lukewarm water. It is applied to the affected area and it should be left for a period of time depending on the intensity of the pain. No poultice, however, should be left on for more than twenty minutes. In addition to the pains caused by muscular stiffness, &c., such pains as flatulent colic can be relieved by the application of a mustard poultice at the site of the pain.

In preparing a mustard poultice or bath, boiling water or water above 140 deg. Fahr. should not be added directly to the mustard owing to the fact that the enzyme myrosin would be inactivated. Where a really hot poultice is required it is best to mix the mustard with a little cold or lukewarm water and allow to stand for a few minutes to enable the volatile oil to be liberated. Boiling water can then be added if desired. It is not desirable to apply a mustard poultice to broken skin. If a poultice made from mustard alone is too strong, it can be made less potent by mixing it with linseed meal or with flour.

# Beef Cattle at the Brisbane Show.

[*Blocks by Courtesy of the Graziers' Review, Qld.*]

Plate 87.

Winners of the P. and O. prize for the pen of six bullocks. Exhibited by Messrs. I. J. and M. S. Moore, of Barambah, Goomeri, and purchased by T. Playfair Ltd., of Sydney.

PLATE 88.
Balcomba Ramrod 200th, Reserve Champion Hereford Bull. Bred and exhibited by Messrs. Wilson and McDouall, of Calliope.


Plate 89.

Ennisview Sir John, Champion Hereford Bull. Bred and exhibited by Mr. E. R. Reynolds, Ennisview, Oakey.

Plate 90.
Netherby Royal Challenge, Champion Shorthorn Bull for the fourth time in succession. Bred and exhibited by Mr. J. T. Scrymgeour, Netherby, Warwick.

Plate 91.

Bluff Prince 661st, Champion Devon Bull. Bred and exhibited by Mr. R. A. Howell, Killarney South.

Plate 92.
Cabulcha Glossary, Champion Aberdeen-Angus Bull. Bred and exhibited by Mr. J. M. Newman, of Caboolture.

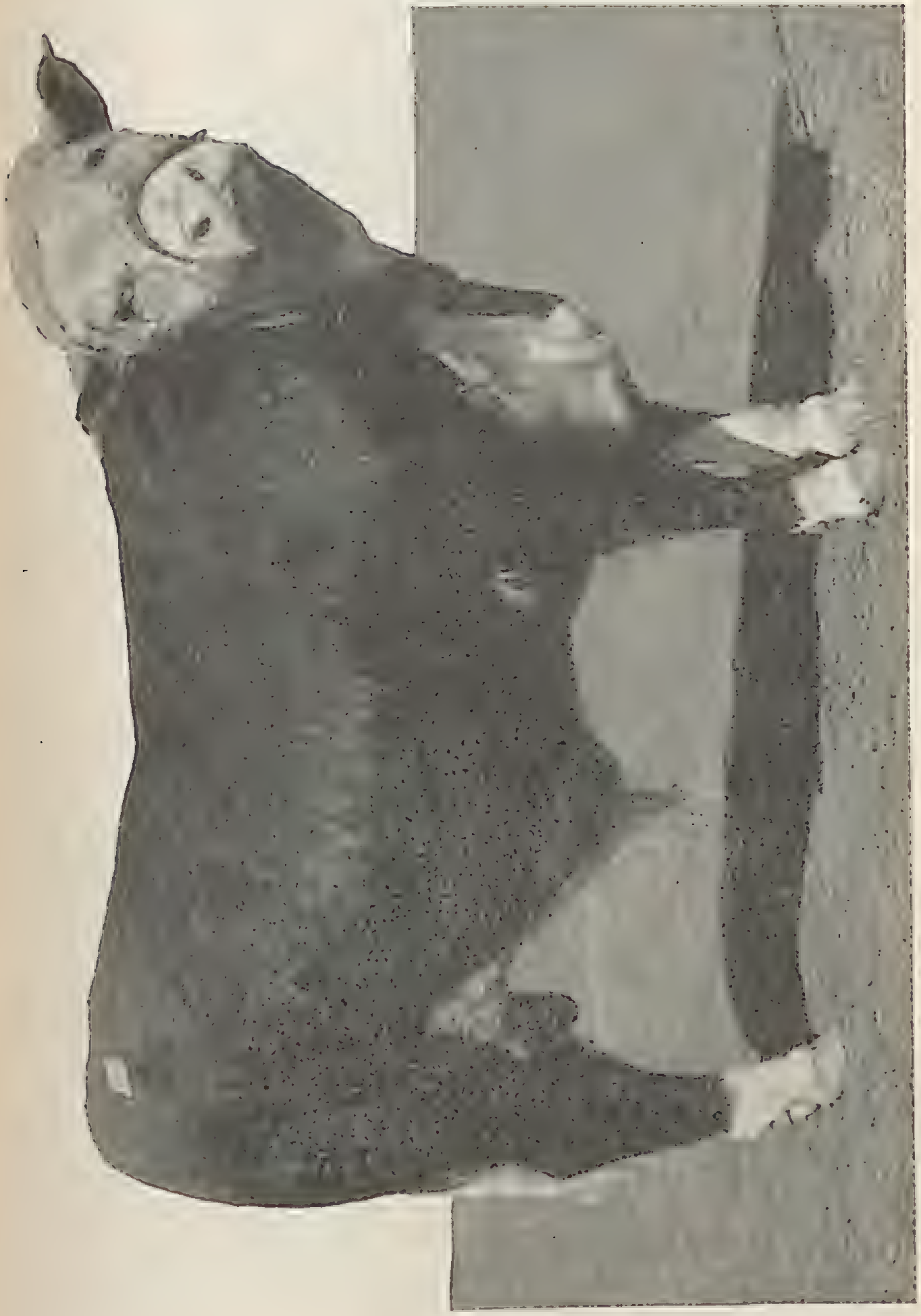

Plate 93.

Ennisview Conqueror, winner of the bull class, six months and under twelve months, also one of the pair of bulls which won the Frank Reynolds' Memorial Trophy. Bred and exhibited by Mr. E. R. Reynolds, of Ennisview, Oakey.

PLATE 94.

Ennisview Cherry Ripe 5th and Ennisview Minerva 10th, First and Second Prize winners in the heifer calf class, respectively, and winners of the pair of heifers class, six months and under twelve. Bred and exhibited by Mr. E. R. Reynolds, of Ennisview, Oakey. Although our illustration makes the near-side heifer appear smaller, in reality it was not so. The judge said, "I have never seen a pair of heifers so evenly matched."

Plate 95.

Netherby Snow Queen, Champion Shorthorn Cow for the second time. Bred and exhibited by Mr. J. T. Scrymgeour, Netherby, Warwick.

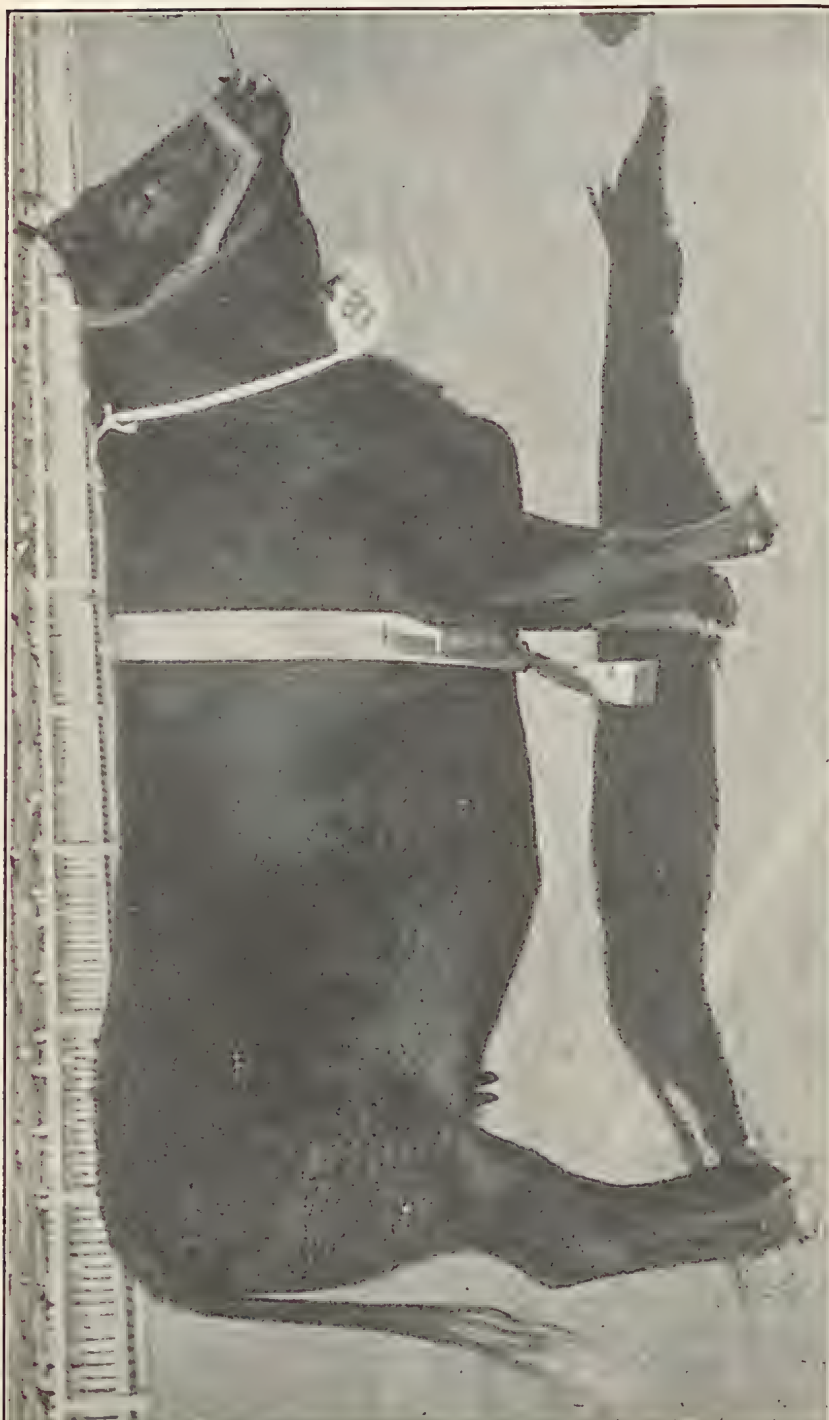

Plate 96.
Contessa 154th, Champion Devon Cow for the second time. Bred and exhibited by Mr. R. H. Howell, Killarney South.

Plate 97.

Ennisview Lady Illustrious, Champion Hereford Cow. Bred and exhibited by Mr. E. R. Reynolds, Ennisview, Oakey.

PLATE 98.

Bald Blair Merry, Champion Aberdeen-Angus Cow. Bred and exhibited by Messrs. F. J. White and Sons, Bald Blair, Guyra, New South Wales.

# Dairy Cattle at the Brisbane Show.

*[Photos. by Department of Agriculture and Stock.]*

Plate 99.
Kilburnie Ethel III., Champion Australian Illawarra Shorthorn Cow, the property of Messrs. Macfarlane Bros.

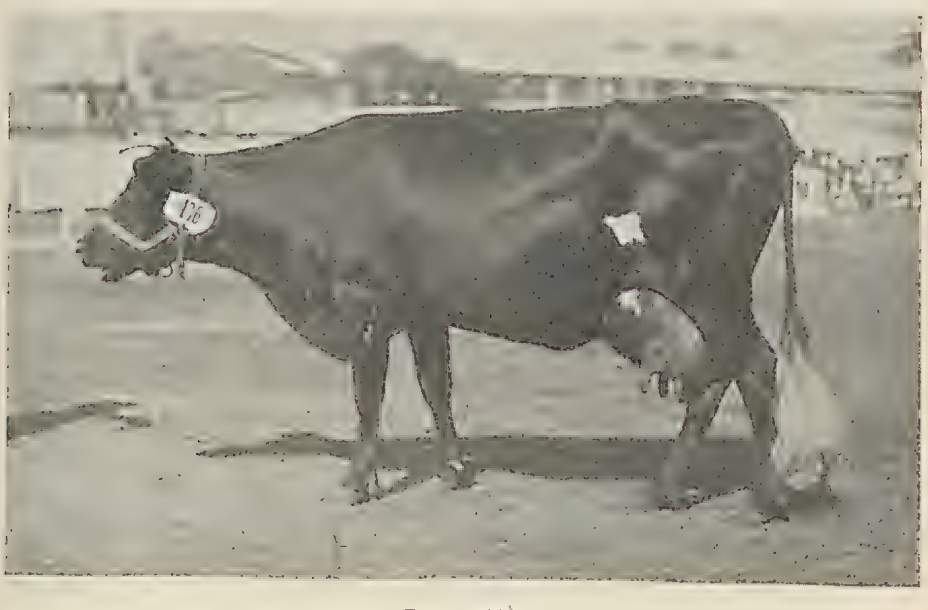

Plate 100.
Cedargrove Ursula, Champion Butter-fat Cow, the property of Mr. W. J. Freeman.

Plate 101.
Patrol of Cosey Camp, Champion Illawarra Shorthorn Bull, bred by Mr. W. W. James and exhibited by Mr. P. Moore.

Plate 102.
Oxford Ginger Girl, Champion Jersey Cow, the property of Messrs. E. Burton and Sons.

Plate 103.
Somehope, Champion Jersey Bull, the property of Messrs. J. Sinnamon and Sons.

Plate 104.
College Princess Pontiac, Champion Friesian Cow, the property of Messrs. Hickey and Sons.

Plate 105.
Tenthill Starling's Actuary, Champion Friesian Bull, bred and exhibited by Mr. W. H. Grams.

Plate 106.
Moongi Prairie Flower, Champion Guernsey Cow, bred by Mr. E. E. Cooke and exhibited by Mr. W. Cooke.

Plate 107.
Linwood Favour, Champion Guernsey Bull, bred by Mr. A. S. Cooke and exhibited by Mr. W. Cooke.

Plate 108.
Fairview Lady Bess, Champion Ayrshire Cow, the property of Mr. R. M. Anderson.

PLATE 109.
Claredale Bonny Billy, Champion Ayrshire Bull, the property of Mr. T. Holmes.

## A CLINICAL CASE OF ANAPLASMOSIS.

D. FORSYTH STEWART, B.V. Sc.

Although the existence of Anaplasma marginale has been established in Queensland, the extent of the area of infection has been in doubt, and it is thought that it would be of interest to record the occurrence of a mortality due to this organism at Alberton, situated about six miles from Beenleigh, which is on the South Coast line.

The history of the deaths which have taken place on the farm in question is as follows:—

Two years ago four cows were lost on this property. Of these, three died after an illness of several days, but one had survived for five weeks before death took place.

On the occasion of my visit in July of this year two cows, exhibiting similar symptoms to those which had been lost two years previously, had become affected. Of these two, one had survived for six days and had died about a week prior to my visit; the other had been ill for nine days at the time of my examination and was then recovering.

The case was a dry cow of four years of age. The owner stated that the cow was in good condition before it had become affected, but at the time of examination it was in very poor condition and obviously had wasted very rapidly. Although the cow had refused to feed or drink for the first week of its illness these desires had been restored and rumination was observed. Ticks in various stages of development were attached to the beast, and the owner stated that five weeks had elapsed since he had dipped the cattle. Also, he considered that the cattle, when examined, were more seriously tick infested than they had been at any time this year.

Beyond the marked loss of condition the following clinical symptoms were noticed. The coat was harsh and dry. The eye was sunken. The temperature was 103 deg. F. Fæces passed were somewhat dark but otherwise normal. There was no evidence of hæmoglobinuria. Occasionally the animal was heard to grind its teeth.

A smear was taken from the peripheral blood and, on return to the laboratory, fixed and stained with a modified Romanowski stain.

On examination of the smear the presence of Anaplasma marginale and Theileria mutans were noted. The organisms were not numerous, one being seen in every several microscopic field.

# NATURAL PASTURE DEFICIENCY DURING WINTER MONTHS.

By J. L. HODGE, Instructor in Sheep and Wool.*

COMPARATIVELY few years ago it was difficult to convince some graziers that their sheep were suffering from malnutrition during the winter months. To the inexperienced eye there is plenty of feed, and the idea of semi-starvation under these conditions is not generally accepted. However, it is no new thing now for the Sheep and Wool Branch of the Department of Agriculture and Stock to receive requests for assistance in the matter of winter feeding. Taking a large proportion of the Darling Downs as an example, it has now become obvious that constant stocking with sheep over a long period of years has to a great extent destroyed the indigenous grasses, and especially the winter grasses, which in the old days were regarded as so valuable. The question naturally arises what to do to supply some supplementary feed during these trying months, having due regard to economy in these times of depressed prices.

## Overstocking.

There is no doubt whatever that overstocking is resorted to in some cases. This is a practice which cannot be too strongly condemned. If the grazier would realise that it was to his financial benefit to conserve the pastures, we would have less of it. Two sheep well fed will realise more to the grower than three half-fed animals. We always advise the grazier to ascertain carefully the carrying capacity of his area, and then stock well within that capacity.

## Cultivation.

On small areas, where practicable, cultivation on the Darling Downs must come into general practice if sheep, and especially fat lambs, are to be raised profitably. Wheat, barley, and oats all suggest themselves. All are excellent sheep feeds, and apart from that the grower may harvest a cereal crop. Lucerne, than which there is no better sheep feed, should be planted anywhere in the localities suitable to it. Rhodes grass has been proved in scrub areas, and a great deal more use should be made of it.

## Wheat and Sheep.

As far as the farmer is concerned, the day has arrived on the Darling Downs when the question is not: "Can the farmer run sheep?" but rather: "Can he afford to be without them?"

Judged from every point of view the results of the combination, sheep and wheat, if properly handled, are profitable under average conditions. In a good season in Queensland sheep are almost a necessity in connection with the crop itself. Fed off at the right time it causes the crop to stool, resulting in a heavier growth. Wheat is an excellent fodder for sheep, healthy and quick fattening, and suitable for any class of sheep. Its chief value, however, apart from profit is in the opportunity it gives to make marketable aged sheep, both ewes and wethers, which will readily fatten on wheat; whereas the task of getting them into a marketable condition on natural grasses would be hopeless. An opportunity presents itself in the matter of fat lambs. No crop excels wheat in this connection. The period, too, at which wheat should be fed off lends itself to this branch of the industry. In connection with this phase of the subject, it is well to sound a note of warning with regard to ewes fat and heavy in lamb. Plethora is to be feared. The farmer under these circumstances would be well advised to keep the ewes off the wheat, except for short periods of feeding, until they have lambed. They can then be depastured on with impunity. Dry sheep may, of course, be run on wheat all the time.

Sheep, being natural scavengers, are of inestimable value in cleaning up the headlands which so often prove the breeding grounds for pests—insect, vegetable, or fungus. It should be the object of the farmer to fatten everything rather than run a flock all the year round. This applies to the wheat farmer purely and simply. Of course, circumstances alter cases, and when the farmer is the possessor of pasture land it should be his first consideration to procure a flock of ewes suitable to his locality, and retain such for breeding purposes in connection with the fat lamb industry.

* In a radio address from 4QG.

It follows in this case that the farmer must so manage his flock as to have his ewes "dropping" coincident with that period when the wheat is ready for feeding off. In the case of a purchased flock, the farmer should make arrangements for his sheep well beforehand so as to be in a position to start feeding off at the time required.

Everything at present points to the fact that wheat is going to be more largely grown in Queensland in the future, and if such is the case, the farmer should not lose the opportunity offering to increase his yearly profits, and, at the same time, save no small amount in the matter of cultivation. The stubble is not to be ignored, and the method adopted by some farmers, that of burning, is condemned. Sheep do excellently on a stubble field, and for this purpose we would advise the purchase of wethers forward store in condition.

So much, then, for the small man, but what is to be done in the case of large grazing areas on the Downs?

The advice with regard to overstocking, of course, applies here, but altogether apart from this the time is fast approaching, or has arrived, when the owner of purely grazing country will have to do something to ensure the better feeding of his sheep during the winter months. It is a matter of economics to decide whether cultivation is the remedy. At present depressed prices for commodities the outlay would possibly be unprofitable, but with a return to normal prices, the opinion is ventured that the operation would be profitable. The sowing of winter grasses at the right period of the year should receive attention. We would advise all growers suffering the disability of mal-nutrition among their sheep in the cold months to experiment with different grasses suitable to the season in a five-acre plot, keeping a careful account of the costs, and observing with the greatest care the results of such trials.

## Licks Containing a Protein.

The grazier may, to a great extent, help the position economically by supplying a lick made up for ordinary purposes, but also containing a protein. We would advise the purchase of the following ingredients and their mixing in the proportions stated:—

| | |
|---|---|
| Nauru phosphate (finely ground) .. .. | 40 per cent. |
| Salt (butchers' quality) .. .. .. | 40 per cent. |
| Sulphate of Iron .. .. .. .. | 4 per cent. |
| Epsom Salts .. .. .. .. .. | 4 per cent. |
| Linseed meal, cotton meal, or maize meal | 12 per cent. |
| | 100 per cent. |

Here you have phosphoric acid $P_2O_5$, necessary to all animal life contained in the Nauru phosphate, a necessity in salt, a tonic in the sulphate of iron, a laxative, if required, in the Epsom salts, and the protein recommended in the meal.

This lick may be given with safety all the year round if necessary to dry sheep, but it is as well to sound a note of warning with regard to ewes half way through the period of gestation. From these a great proportion of the salt should be taken away at the period mentioned on account of the fact that, with the meal added, the ewes run some risk of taking too much salt, with possible lambing trouble.

This subject of winter feeding is not peculiar to Queensland. Practically every country in the world has to make some provision for this trying season of the year to such an extent, indeed, that in many countries, the stock are, of necessity, housed and hand fed. We may consider ourselves fortunate that we are exempt from these conditions, but it behoves us all to study this most important question from an economical point of view, with the idea of greater individual and State prosperity.

## Experimental.

After consultation with an officer of the Agricultural Department we would advise graziers to experiment as follows:—

Lightly cultivate the plot by the disturbance, to a depth of 2 or 3 inches, of the surface soil. Have the experimental plot ready for sowing during the autumn months. Broadcast 5 lb. of Phalaris tuberosa (a strain of Canary grass) mixed with 5 lb. of fine sawdust or clean fine wood ashes. We have reason to think that this winter grass may prove valuable in providing winter feed. A most careful record of the costs should be kept and the results carefully watched. After all, it is only a matter of economics.

# THE DAIRY INDUSTRY.

## PASTURE MANAGEMENT.

DAIRY BRANCH.

In previous notes emphasis was placed on the need for the improvement of the production per cow, and sound breeding and weeding or culling were strongly advocated.

The culling of ''boarders'' is essential, and breeding should be confined to the best of the producers. In addition to breeding and weeding, proper attention to feeding is also essential.

No matter what the output may be it must be efficiently produced, and by practising pasture improvement increased efficiency in dairy farming will be gained.

To restrict production by neglecting essentials—such as pasture improvement, the growing and conserving of fodder crops, and the improvement of dairy stock—is quite unsound, irrespective of any restriction in export that might occur.

### Preservation and Improvement of Grass Lands.

Feeding is a most comprehensive subject, and all phases of it cannot be covered in one article. In these notes we shall deal with the feeding of pastures on general lines.

The importance of the work of the preservation and improvement of the grass lands of the State cannot be over emphasised. Native pastures are among the State's greatest natural resources—an asset that has hitherto been neglected through lack of interest and knowledge.

The progress of Queensland and the prosperity of its people are almost entirely dependent on primary production.

The exports of grassland products from British Dominions constitutes 94 per cent. of the total exports of New Zealand, 60 per cent. of the total exports of Australia, 55 per cent. of the Irish Free State's, 41 per cent. of South Africa's, and 17 per cent. of Canada's; while 64 per cent. of the agricultural production of Great Britain is derived from its pastures.

Our pastures, indigenous and introduced, are producing over 70 per cent. of the gross return of the primary industries of this State. The importance of pastures in dairy farming is therefore difficult to over-estimate. The pastures may be looked upon as the raw materials used in the production of wool, meats, and dairy commodities.

The following figures indicate the number of sheep and cattle in Australia, and when it is realised that practically all of them are supported on pasture, the importance of grass in our national economy will be readily realised.

Sheep (Merino) in Australia.

| | |
|---|---|
| New South Wales .. .. .. .. | 53,000,000 |
| Victoria .. .. .. .. .. .. | 16,376,217 |
| Queensland .. .. .. .. .. | 22,324,278 |
| South Australia .. .. .. .. | 6,608,981 |
| West Australia .. .. .. .. | 10,096,614 |
| Tasmania .. .. .. .. .. | 2,100,000 |
| Northern Territory and Federal Capital Territory .. .. .. .. .. | 214,000 |

Cattle in Australia.

| | |
|---|---|
| Queensland (nearly 50 per cent.) .. .. | 6,378,000 |
| New South Wales .. .. .. .. | 3,000,000 |
| Victoria .. .. .. .. .. | 1,606,000 |
| West Australia .. .. .. .. | 891,000 |
| Northern Territory .. .. .. .. | 844,000 |
| South Australia .. .. .. .. | 214,000 |
| Tasmania .. .. .. .. .. | 220,000 |

It is essential, then, in our pasture improvement work to think of and treat pasture as a crop in comparative terms with other farm crops. If it is worth while using the plough to produce an annual fodder crop, surely it is more important that we give adequate attention to our grasses, which represent a permanent pasture.

**Grass the Cheapest and Best Stock Food.**

Good grass is the cheapest and best single stock food. No form of fodder can compete in cheapness with natural grasses and herbage. Unfortunately, in favourable seasons an enormous quantity of grass goes to waste, for practically all grasses after exposure to heavy dews and scorching sun rapidly deteriorate, losing colour, flavour, and quality; and having but little food value they are only fit for the firestick.

There is little difference between the food values of the various cultivated grasses—paspalum, Rhodes grass, and Sudan grass, and others—yet they vary considerably in composition according to the season, locality, and age of the crop. There are a few grasses like couch grass and prairie grass which stand out on their own, on account of their high food value.

As the dairy cow is required to produce large quantities of milk rich in protein, it naturally follows that it must be fed on fodders also rich in protein. The high percentage of protein in grass while it is in its early stages of growth makes it advisable to feed grasses in as young a stage as possible. As a matter of fact, young shoots of grass, about 4 to 6 inches high, are equal to many valued concentrates in protein content, and this accounts for the rapid recovery of poor cattle when grazed on pastures freshened by a few showers of rain after spells of dry weather, or after a burn.

**How Pastures can be Improved.**

There are several ways in which pastures can be improved, namely:—

*The growing of grasses possessing a high feeding value*—In dealing with the growing of grass of a high feeding value, we must not lose sight of nature's adaptation of grasses to different localities. In selecting a species of grass, attention must be given to adaptability to local climatic conditions, period of growth and production, nutritional value, palatability, and suitability for grazing and hay-making. Naturally, a vast amount of experimental work is necessary, which is best carried out on the farms in various districts.

*Top dressing of pasture land*—Top dressing of pastures lengthens the grazing season and increases returns. Whether it is practicable or not must be worked out in terms of £ s. d., taking into account conditions, price of fertilizer, and market value of the product. Little benefit will accrue from the practice, unless carried out in conjunction with rotational grazing and renovation of pasture.

*Rotational grazing, or, in other words, feeding the grass while in its young stage of growth*—Controlled rotational grazing, which does not involve so great an outlay, is more a matter of pasture improvement, ensuring the economical use of herbage. The subdivision of holdings to provide for rotational grazing, or the feeding of pasture in its early stages, appears to offer the most ready means of securing an immediate benefit through pasture management.

The chief advantages of rotational grazing are—

(*a*) The animals consume the grass in its early stage of growth when rich in protein.

(*b*) The grass is kept evenly cropped.

(*c*) The animals do not wander over long distances in getting their food, thus extending the grazing time, and preventing the destruction of a quantity of pasture.

*Renovation of pastures*—The carrying capacity of pasture can very often be doubled by renovation. This is a most important aspect of pasture improvement.

Pastures which are in a very unthrifty, root-bound, matted condition can be loosened up by the use of a renovator effectually breaking up the matted root mass and promoting a fresh growth of succulent grass. This should be practiced in conjunction with rotational grazing. The value of rotational grazing and the renovation of pastures cannot be too strongly emphasised, and any dairy farmer who gives attention to these points in pasture management will secure undoubted benefit from its practice.

In considering grasses, we must remember that they are divided into two broad classes—summer grasses and winter grasses. Most of our pasture grasses are summer-growing, and, consequently, it is necessary to extend the grazing period by the introduction where suitable for winter-growing grasses, such as prairie, cocksfoot, *phalaris tuberosa* or clover (which will necessarily be limited in extent).

When any of these grasses have become more or less established, one of the greatest risks is in allowing them to be smothered out by a rank overgrowth of other pasture, such as paspalum. Much experimental work has been conducted in regard to these winter-growing grasses, but it is desirable for dairy farmers to experiment on their own properties under the conditions peculiar to their district and to their soils.

### Our Native Grasses.

Queensland is rich in the number and nutritive properties of our native grasses. The characteristic feature of many is their drought resistance, which is apparent chiefly on our plain and downs country, and our Western lands. Mixed pasturage of grasses and herbage are met with, particularly in the Downs country, providing a highly nutritive pasturage.

Overstocking has been responsible for deterioration of native pastures in most instances, causing the eating-out or destruction of the best of the more nutritive grasses, and the introduction of exotic weeds.

Native grasses in Queensland comprise upwards of 450 varieties, including many of high nutritional value. Combined with herbage, which is found particularly on the Darling Downs, many of our native grasses are all sufficient as a ration.

### Conserving Pastures.

The greatest difficulty facing the farmer who depends absolutely on pasture is the great variation in the seasonal production of grass.

There are four ways in which the dairy farmer may overcome this difference in the carrying capacity of his pasture—

1. By top-dressing in autumn in coastal paspalum areas, and early spring top-dressing to bring the pastures away earlier.
2. Growing and conserving special crops, such as maize, sorghum, and other fodders.
3. Establishing special pastures of winter-growing grasses, such as cocksfoot, *phalaris tuberosa*, &c., where possible in suitable districts.
4. Conserving as hay or silage all surplus grass before it has gone to seed and lost its feeding value.

The value of growing and conserving special crops, such as maize and sorghum, is well known, though not practiced to the extent it should be. This refers more particularly to the conservation of such fodder.

Very little has been done in the way of establishing winter-growing grasses—a most important factor in extending the grazing period of pasture, and consequently increasing carrying capacity. Likewise, the conserving of pasture in the form of hay or silage is given scant attention. It would be regarded by farmers as a wasteful practice to allow, say, a crop of several acres of sorghum to rot on the field without making an effort to conserve it; yet many absolutely disregard a fine growth of pasture which, pound for pound, may be relatively more valuable than the sorghum.

Nearly every year our coastal dairy farmers have a surplus of grass in the flush months of January, February, and March. This grass is allowed to go to seed and lose feeding value by becoming rank, overgrown, and stemmy. This grass should always be cut, when practicable, whilst still young and leafy and made into hay.

### Supplementary Fodder Crops.

It is not intended to deal with supplementary fodder crops or their conservation in this article, which is intended to draw attention to the value of pasture in our rural economy, and to point to measures which may be adopted by dairy farmers in the interests of efficiency in dairy farm practice.

*THE JOURNAL A HELP.*

*A Camp Mountain farmer writes* (17*th September*, 1933):—" . . *I find your Journal a great benefit and help, and may it long continue!*"

# AGRICULTURAL NOTES.

By H. S. HUNTER, Agricultural Branch.

## CROP PROSPECTS.

THE past month has witnessed a period of considerable activity throughout the farming districts in connection with the coming season's cropping. The spring potato planting has been completed, and early sowings have been made of maize and dairy fodder crops. It has been necessary to keep the soil well worked in order to conserve as much moisture as possible from the winter rains. Severe frosts in the inland ditricts early in the month were responsible for damage to early potato crops, and imposed a check on early plantings of maize. Now that warmer weather has made an appearance the general planting of summer-growing crops may be proceeded with, where sufficient moisture is available for the purpose.

Although, in a general sense, the spring has been ushered in under conditions more favourable than usual, this does not apply in the case of all localities. Rain is badly needed, for example, in the Lockyer and Fassifern districts, where in some instances stockowners are removing stock for agistment to country better supplied with feed and water.

### Maize.

As this is the most important maize-growing area of the State, the former anticipations of a record early maize crop may not be realised. However, in the mixed farming districts, the spring planting usually is made with a view to the provision of green feed or silage for dairy stock, particularly since the maintenance of a good milk output has become an economic necessity to many farmers. Silage making is much more in vogue than was the case a few years ago, and where the farm is not equipped with a tub silo the cheaper types of silos are being constructed, particularly the trench, which is increasing in popularity. There are indications that, given favourable weather conditions, there will be extensive plantings of maize this season in the Burnett and Darling Downs areas. The maize crop on the Atherton Tableland, where harvesting now has been completed, is expected to provide a total yield of aproximately 20,000 tons. Although prolonged wet weather was experienced during portion of the growing season, the grain is reported to be of exceptionally good quality.

### Cotton.

There is every indication that the coming season will witness a cotton planting equal to last season's record of about 80,000 acres. Already seed has been distributed for nearly 50,000 acres. In the main cotton belt of the Upper Burnett and Callide, seasonal conditions are more propitious for a successful planting at the ideal time of the year than at any time in the history of cotton growing in that area. Many acres of new scrub country have been cleared, and in some instances old-established growers are extending their areas.

In Southern Queensland a plot of cotton as a sideline crop is coming back into favour. Although only moderate yields were obtained last year, owing to adverse seasonal conditions, the cotton crops stood up to the dry conditions better than maize, and provided sufficiently attractive returns to warrant an increase both in the acreage and the number of growers, which can be expected if suitable rains fall during the current month. There is now a greater feeling of confidence in the future of the cotton industry, as the recent attitude of the Federal Government towards it gives an indication that it may enjoy a greater measure of stability from a political point of view.

### Tobacco.

Land preparation is well advanced for the forthcoming tobacco-growing season. The total area under tobacco last season is estimated at 7,400 acres approximately, and the yield of cured leaf at about 2,250,000 lb. The fact that the general average quality of the leaf was adversely affected by the faulty distribution of the rainfall naturally has caused disappointment to the growers, but the majority of them are facing the approaching season with every confidence, and express the opinion that as a result of their experiences they are better equipped with essential technical knowledge.

It is more widely recognised also that success cannot be expected to attend the efforts of growers generally unless all concerned take effective action to deal with the pest and disease menace by observing in the respective districts a more uniform growing season and by uprooting and destroying all old plants immediately after harvesting.

**Winter Cereals.**

The crops of wheat, barley, and canary seed are in a very satisfactory condition, and should rain of a general nature have fallen over the wheat belt by the time these notes appear in print the prospects for a bumper yield will be particularly promising. It is estimated that the area planted with wheat is considerably in excess of last season's area of 311,000 acres, and should favourable seasonal conditions continue a yield of about 4,500,000 bushels is anticipated. Not only are the conditions generally satisfactory in the main wheat belt, but the Maranoa to date has experienced an unusually favourable season, although the crop was planted about a month late. In the Dawson Valley there has been ample rainfall for wheat this season, a factor that has been responsible for crop failures there during the past three years.

A proportion of the area under malting barley has been planted this year with seed of the Winter, Spratt, and Plumage Archer varieties imported from New Zealand with the object of improving the malting qualities of the locally-grown grain. Seed propagation areas of these varieties have been planted also with seed imported from England for the purpose by the Department of Agriculture.

**Dairying.**

With the arrival of the warmer weather and an improvement in the pasture, the output of dairy products is on the increase, and the mixed farmer has been encouraged further by a welcome improvement in the market values of butter and pigs.

The local markets for farm fodders, potatoes, &c., have continued reasonably buoyant, considering the ruling values of commodities generally.

There is a growing recognition throughout Australia of the necessity to improve dairy herds by the use of selection bred-for-production bulls and the culling of unprofitable cows. The reported destruction of large numbers of dairy cows in Denmark can be calculated to raise considerably the average production per cow in that country.

**A Correction.**

In "Agricultural Notes," September issue, page 230, under the sidehead "Clydesdales in Demand," second line, an obvious error in figures occurred when it was made to appear that there are "12,223 tractors" in operation on Queensland wheat farms. The misprint was due to an error in the typed copy, which was overlooked in the proof reading. The number of tractors in use on Queensland wheat farms is 1,223. The paragraph as corrected should read—

A recent survey of the forms of tractive power employed on wheat farms in Queensland reveals that 1,223 tractors and 16,764 horses are employed in this industry. Both tractor and hores are used by 753 wheatgrowers, and 1,300 farmers rely on horses only.

## SUMMER-TRAINING YOUNG DECIDUOUS TREES.

It is necessary during the spring and early part of the summer to look through young deciduous trees periodically, and to direct their growth by pinching back the growing points of leaders which are outstripping their neighbours. This keeps the growth even.

When the leading shoots of young trees are extending very fast it is sometimes necessary to pinch them back to prevent them being broken out, or blown out of shape by heavy winds. Care should be taken when doing this that the shoots are not cut or pinched back below the tender growth, as if the more mature woody growth below is cut into there is a liability to permanently stunt some kinds and varieties of fruit trees. Even with vigorous older trees it may be advantageous to thin the growth to some extent to allow more light to penetrate through the tree.

This work must be carried out carefully, and it is far better to underdo it than to overdo it. If shoots are thinned out to too few the remainder are far more liable to be destroyed by winds. Superfluous shoots towards the centre of upright growing trees encourage the desired shoots to grow with more outward spread. Moreover, it should never be forgotten that the leaves are the lungs and digestive organs of a plant, and any reduction of foliage checks the growth of the plant.

Trees that have been reworked by budding or grafting require the same care as the young trees, but though strong shoots from the stock must be checked or entirely removed if they are sapping the growth from the buds or grafts, it is a distinct advantage to leave as much foliage as possible.

# MAIZE GROWING ON THE ATHERTON TABLELAND.

By O. L. HASSELL, Instructor in Agriculture.

THE Atherton Tableland maize belt is situated 68 miles by rail from the port of Cairns, between the 17th and 18th degrees of latitude south, and between 2,500 ft. and 3,000 ft. above sea level, and the town of Atherton is its commercial centre.

Atherton is named after Mr. John Atherton, one of the earliest pioneers of the district who selected land in that part of the country some time before there was any railway communication.

## Climate and Rainfall.

Being situated in the tropics the growing season is one of heavy rainfall, characterised by more or less heavy thunder storms, with diminishing intervals between, and bright hot days, during which the necessary cultivation of the young crop is effected. In the ripening period of the grain the days are dull and cloudy, with a persistent drizzling rain or mist. The atmosphere becomes so humid that evaporation of moisture from the ripened cobs, to permit of them being harvested, is slow, delaying operations until about the end of July, when rain generally ceases.

## Soil.

The soils of the areas devoted to maize growing on the Tableland are wholly a rich volcanic loam, red shading to chocolate in colour and of great depth. They are locally termed scrub and forest, respectively, from the growth peculiar to them in their virgin state. From the total analysis these soils are extremely rich, comparing very favourably with any other large soil areas in the world. This fertility is also evidenced in the crops of maize obtained. In a good season and under proper cultivation the soil is yielding satisfactory returns after forty years continuous cropping and without the addition of commercial fertilizers.

## Beginnings of Maize growing at Atherton.

The original dense jungle was famous for its heavy growth of valuable timbers. Maize was first grown on the Tablelands as far back as 1870. The discovery of tin at Herberton in 1880 and the rush from Thornborough to the stream tin diggings on that field opened a small market for the few poineer maize growers. The maize was carted over the range and sold on the mining field at about £3 a ton. Later came the influx of the Chinese, on whom there was practically no restriction. The Chinaman is no axeman or bush worker, so the land was selected by White Australians, who felled and burnt the jungle, while the Chinaman came in as lessee at the rate of no rent for the first year, 10s. for the second year, and £1 per acre for the third and following years.

The Chinaman's only method of tilling the soil for many years was with the hoe. The maize crop was grown amongst the stumps and logs left after the fire, and no further clearing was done. The extraordinary fertility of the soil and the regular rainfall were conducive to very heavy crops.

Harvesting was done by the Chinamen. They pulled the maize, bagged it, and carried it out on their backs to central tracks, where it was loaded on to sledges and taken to roughly constructed barns. The maize was shelled with the ordinary hand sheller, and if an immediate sale were not made it was stored for various periods in the barns, where much damage was done by weevils and mice.

Queensland, however, was little the richer for the Chinaman's efforts, for most of his earnings eventually went to China. Many of the shrewder of his compatriots, acting as dealers in maize in later years, made large sums of money by buying when the product was cheap and selling when scarce and high prices were ruling. This did not take place until the growth of Cairns and extension of railways provided a good local market. Alien restriction legislation subsequently limited the number engaged in the trade.

The resumption of a portion of the Atherton lands to form the Tolga Soldiers' Settlement was made in 1921, and this was really the first widespread movement towards keeping maize growing on the Tableland a white man's industry.

The passing of the Chinaman meant that Atherton had at last come into its own, and was on its way to become one of Australia's foremost maize growing regions.

In later years the remaining Chinamen learnt from the Australian farmer the better method of storing maize in hermetically sealed tanks, but this method did not prove highly satisfactory in many cases, due to the lack of any appliance for determining the moisture content of the grain before storage, although the expert farmer was able to judge fairly correctly whether his maize was fit to store or not.

In these days maize was shipped to different parts of Australia and, at times, was found on arrival to be unfit for use, as it had been loaded with too high a moisture content, and had heated in transit.

The marketing of all the Atherton Tableland maize before the advent of the pooling system was in the hands of the local storekeepers and the large merchants from other centres with their representative buyers.

No attempt was made to artificially dry the maize, which is essential, owing to the moist climate during the ripening period and the length of time it takes to dry naturally in the field, and the loss due to mould.

In 1923 the establishment of the Maize Pool was followed by the construction of three sets of silos capable of holding, approximately, 3,000 tons each, and fitted with a modern cleaning plant and elevators. The silo at Atherton is fitted with a specially constructed drying plant. The others at Tolga and Kairi have only the cleaning plant and elevators. All these improvements meant—

(*a*) A better system of storage;

(*b*) More efficient handling of the large crop;

(*c*) Modern methods for cleaning, drying, and testing as to moisture content, &c.; and

(*d*) Prevention from damage by weevils and mice once the product is stored in the silos.

The storage capacity of the silo at Atherton is being increased; when completed its storage capacity will be 13,500 tons.

The present pooling system is controlled by a board consisting of five farmers elected by the growers. Since the establishment of the maize pool a large quantity of maize has been shipped overseas (as much as 5,000 tons in one shipment), and reports show satisfactory delivery of good quality grain.

### Value of the Maize Industry at Atherton.

Regarding the value of the maize industry to North Queensland, the following information has been supplied by the Atherton Tableland Maize Pool Board:—

> Approximately 18,000 acres are utilised annually for maize growing, producing an average crop of 17,000 tons of maize. From 350 to 400 families are engaged annually in the industry, and approximately 170,500 tons of maize have been handled by the pool during the past ten years, representing an amount paid to the growers of about £1,075,000 after the deduction of all administrative and working expenses.

An increase in the foregoing figures may be looked for when machinery is added to the silos to treat the raw material for the manufacture of many maize by-products.

The district pig industry, a thriving one with its Co-operative Bacon Factory at Floreat, is partly dependent on the maize industry. The establishment on a sound basis of so important an industry stands greatly to the credit of those concerned in its foundation, in that it has been the means of settling many men and their families on the land and of adding to the commercial importance of the far North.

### Seed Maize Selection and Raising of a Standard Variety.

The selection of a seed maize with a view to obtaining a variety most suited to any particular locality is of vast importance to every Tableland maize grower. The variety that will produce the heaviest yield, best quality and resist disease and mould in wet seasons are all points to be observed in the selection of seed maize as well as the characteristics of plant growth. The farmer who carries out his own method of seed selection knows that by planting an inferior seed he must expect to reap the like. To produce a grain of high quality throughout the district all farmers should plant only the best seed procurable, and to deliver the resultant crop in good order to the silos. It must be remembered that if a maize of poor quality is delivered at the silos, it can not be turned out a merchantable commodity.

**Seed Selection.**

The selection of seed should commence in the field. The farmer should first make himself familiar with the variety which he considers is most suited to his locality. The following points should be observed in field selection:—

Select from good healthy strong stalks free from disease.

Select only those cobs that are low down on the stalk and which, when ripened naturally, have turned down.

A cob with a good thick husk covering and well covered over the tip.

A cob attached to a strong shank.

Having observed the foregoing, the person selecting the seed should tear a strip of husk from the cob while on the stalk, and note as to whether the cob is well filled with good straight rows and the grain true to the required type. If the cob thus opened is not suitable, it should be left on the stalk to be picked during the main harvest. After completing the selection of seed in the field the cobs so secured should be taken to the barn and carefully sorted out. It is advisable to keep only those true to type with good, sound, even grains. When the final selection is complete the cobs should be topped and tailed, the term usually applied to the method of removing the round and irregular grains from both ends. The idea of this is to secure a good even-sized grain, thus obtaining an even plant.

**Storing Seed Maize.**

The weevil will ruin seed maize grain unless properly protected. The best method of storing seed maize is in hermetically sealed tins, especially constructed for the purpose, or by mixing naphthalene with the seed at the rate of 1 lb. to a 400-gallon tank. With the latter method the lid of the tank in which the seed maize is stored may occasionally be lifted and the seed inspected.

**SEED MAIZE FOR SALE.**

**Maizegrowers are informed that the Department now has available for distribution an additional stock of selected stud seed maize of the Improved Yellow Dent variety, price 9s. per bushel, railage paid to the purchaser's nearest railway station. Supplies of all other varieties are exhausted.**

**Improved Yellow Dent.—A tall-growing, late-maturing variety, five to five and a-half months. The ears are cylindrical in shape, carrying sixteen to eighteen tightly packed rows. The grain is deep, wedge-shaped, of rich amber colour, with a yellow tip cap and rough, coarse dent. It is suitable for coastal districts and scrub lands where there is a good rainfall. It is capable of giving heavy yields of grain and fodder. Special strains of this seed have yielded over one hundred bushels per acre under field conditions.**

**As supplies are limited, the quantity available for any one applicant is restricted to not more than three bushels. All orders must be accompanied with remittance. Cheques with exchange added should be made payable to the Under Secretary, Department of Agriculture and Stock, Brisbane.**

## BLUE PANIC GRASS (*Panicum antidotale*).

NUMEROUS inquiries have reached this Department from all over the State regarding this grass, which has been under observation by different officers in the northern and southern portions of Queensland, and the following extracts show its behaviour under varying conditions. In addition, this grass has been tried out at the Queensland acclimatisation gardens at Lawnton.

Some weeks ago an article appeared in one of the Brisbane papers in which an analysis of this grass carried out in the Departmental laboratory was given. By the omission to state that the sample submitted was a moisture-free sample—*i.e.*, dried—it conveyed the impression that its nutritive value was far above that of lucerne, which is incorrect.

An analysis of water-free lucerne shows that lucerne maintains its pride of place as a fodder of high nutritive value. Analyses of samples, unless definitely stated to be "water-free," are totally misleading as to the value of fodder in its green form.

Commenting on the performance of Blue Panic grass under conditions obtaining in the Maranoa, Mr. R. E. Soutter, manager of the State farm, Bungeworgorai, says:—

> "This is a tall, rapid-growing grass, and if its feeding value is even only fair, should prove a wonderful variety in assisting to reclaim the pear country. The small plot here, sown on 17th November, came up rather thickly, and has not had any moisture since it was in the feeding stage other than rain. At time of writing (30th June) it is one compact mass, 5 feet in height, with stalks ½ inch thick and solid, and has produced enough seed to sow a plot 100 times the size taken up by it. The seed, which is produced liberally throughout its growth (the first being collected in March), is of such a nature as to permit of its being sown with the ordinary seed drills."

Plate 110.—Blue Panic Grass.
Note its coarse growth when not mown or closely grazed.

Mr. N. A. R. Pollock, Senior Instructor in Agriculture, writing from Townsville, states:—

> "I would advise that our experience is insufficient to warrant a pronouncement as to its value for pasturage or fodder conservation."

A few rootlets of this and other grasses were obtained, through the courtesy of Professor Prescott, from the Waite Agricultural Research Institute, Glen Osmond, South Australia, some three years ago, and a plot established, but, owing to the necessity then arising for almost undivided attention to be given to instruction in tobacco-leaf production, it was not practicable to proceed further. As a consequence, no data are available on its fodder value, palatability, or behaviour when grazed by stock, particulars of which are regarded as essential to a recommendation or otherwise.

The grass makes a very rapid growth under favourable conditions after being cut down or grown from seed, which is freely produced, but, unless close-grazed or mown down, becomes extremely coarse, as will be noted in that depicted on the accompanying photograph.

At Ingham Mr. Shearer, who obtained a little seed from our plot, speaks very highly of the grass, but on a visit to his farm it was found the favourable impression was due to the rapidity of growth, none having been fed to stock.

In the coming season it is intended to arrange plots of this and other grasses in different districts, from which reliable data may be expected.

A report furnished by Mr. F. F. Coleman, on behalf of the Queensland Pasture Improvement Committee, regarding the performance of this grass at Lawnton states:—

> "This plant can best be described as being of erect habit and blue-green in colour. In its young stages it produces a quantity of succulent leaves. After seed-heads appear it becomes very stemmy and harsh, eventually developing a thin bamboo appearance at a height of 5 feet or over—a summer grower that will also give feed in the cooler months on the coast.
>
> "In our trials it was found that when the spring came a quantity of young leaves appeared from the nodes of the harsh stems, which would provide picking for cattle.
>
> "The storage of plant food in bulbous eyes at the base of each stem enables regrowth after grazing, even under dry conditions.
>
> "If kept well eaten down, the harsh stems naturally cannot appear, and in their place would be found a continuity of short young grass, at which stage the best feeding value is found.
>
> "The following table is set out for comparative purposes:—

| Kind of Plant. | Analysis of Waterfree Material, showing the Highest and Lowest Crude Protein. | Remarks. |
|---|---|---|
| *Panicum antidotale* .. .. | Highest, 20·6 per cent. .. <br> Lowest, 11·5 per cent. .. | Stemmy leafy growth up to 2 ft. 6 in. in height <br> Old growth, stemmy, leafy, harsh. |
| Rhodes Grass .. .. | Highest, 16·4 per cent. .. <br> Lowest, 5·8 per cent. .. | Young leafy growth <br> Old stemmy growth |
| Lucerne .. .. | Highest, 29·4 per cent. .. <br> Lowest, 18·4 per cent. .. | Young leafy growth <br> Preflowering stage, old matured growth, with seed pods showing |

> "From the foregoing analyses it will be observed that lucerne is higher in protein content than both Rhodes grass and *Panicum antidotale.*
>
> "The latter has done well in Rhodes grass areas, but it remains to be proved which is the superior—Rhodes or this grass. This plant, it will be observed, is a panicum, and does not contain the dangerous poison hydrocyanic acid that is found in Johnson grass, *Sorghum vulgare,* and Sudan grass."

# THE PUBLIC SERVICE.

*Of all the official reports presented to Parliament annually, none is more interesting, pithy, and attractive in literary style than that of the Public Service Commissioner, Mr. J. D. Story, I.S.O., and from which the following pointed paragraphs are taken.*

## TEAM MEN AND TEAM WORK.

"FORWARD planning" has become the vogue. Some time ago it was "Produce: produce." Later it was "Reduce: reduce." But slogans, like other things, go awry. We are told to produce for export; we did. Now London calls—reduce your exports; saturation point has been reached. Then the wizards of finance cried, "Reduce expenditure." Dire necessity compelled reduction, and dire necessity is not a respecter of persons or Services. Unfortunately, but unavoidably, reductions boomeranged in places and, in the States, balanced budgets have not yet been reached. Now—"Forward planning." Personally, I rather like the idea. There is room for forward planning in State administration. But, to be really effective, it should be done on a comprehensive scale and not in piecemeal fashion. Forward planning in a State scheme should connote departmental co-operation and co-ordination —team men and team work. All should be for the State; none should be merely for a department; and, particularly, none should be only for self—which is selfishness. The experience of the Employment Council, for example, has shown that, when key men of departments get together in the right spirit and with the will to pull their weight in the country's interests, fine results can be achieved. It has been demonstrated that there are directions in which there can be much good team work in developmental forward planning in roads, lands, forestry, agriculture, mining, public works, &c. But the personal equation counts for much: vision should be wide; ideas should flow freely; original thinking should be welcomed and encouraged; criticism should be constructive and not merely negative, and criticism should not be misconstrued. Unfortunately, however, there is a danger that proposals emanating from a body of this kind will not always be received kindly. At times suggestions which are made with the best of goodwill are received in some quarters with suspicion and looked upon as a form of interference. Amongst the bugbears of administration are the passive resister and passive resistance. On the other hand, amongst the joys of administration are those broad-minded, able, cheery men who pull together, who put the State before self, and who are so sure of themselves that they do not worry about professional dignity.

### The Phantom Host.

There is a widespread obsession that there exists in the Queensland Service a host of higher officials who have been born in the purple, who draw pay, allowances, and perquisites reminiscent of feudal days, and who are a heavier drain upon the Treasury than the exchange and interest payments. But this phantom host is merely the figment of an obsession. Exclusive of the Judges, members of the Industrial Court, and railway officers, there are seventeen officials in Queensland who are allocated nominal salaries in excess of £1,000 per annum. As a result of the operation of the Salaries Act, only seven actually receive salaries over £1,000 per annum. The Director of Education, for instance, draws £902 per annum, and the Under Secretary for Mines £738. One feels a little ashamed to disclose these facts. Indeed, officers in receipt of salaries in excess of £500 per annum in all Crown services (exclusive of Railways), whether paid from the Consolidated Revenue Fund, from Trust Funds, or from Loan Funds, only absorb approximately £155,000, or 4.6 per cent. of the total salary bill of such services. Even if this group were eliminated altogether, the amount which would be saved would not go so far as some people seem to think towards paying the exchange and interest bills or in balancing the budget. And, far from being born in the purple, most of these men have won their positions by preparation, industry, ability, and grit. It seems somewhat trite to say that, if ever a time existed when really good men were needed, that time is to-day. It is true nevertheless. Capable leaders are essential; but the first-grade Economist will not be obtained for the price of a poddy, nor an efficient Roads Commissioner for the pay of a sandwich-man. With really good

leaders at the top, good results are usually obtained throughout the whole range of the organisation; departmental inertia is banished, and amongst those who benefit most are the rank and file. Bad leaders give bad results, and the evil which they do is sometimes well-nigh irreparable. State and civic records afford proof. Crown departments and sub-departments are of sufficient importance to warrant the employment of good men. Moreover, Ministers are entitled to sound advisers.

### Testing Time.

Sweet are the uses of adversity, wrote England's chief bard. But the Queensland Public Service now finds financial adversity rather bitter. In the first year, the Service bore with blended loyalty and stoicism salary-reductions and the withholding of salary increases; these were the Service's personal contributions to budget-balancing and the general demands for reduced expenditure. But, on account of the withholding of automatic increases, even from juniors, in the second year and the third year, a spirit of pessimism began to pervade the ranks. In some ways, the Queensland Service has been hit hardest of all the Services of the States and Commonwealth. The juniors, and the married men with young families, have had a particularly lean time. The only consolation has been that they at least have had jobs—bread without butter or jam.

The position of the male junior clerk who, during last financial year, completed three years' service is shown hereunder:—

| Financial Year. | Salary Payable if Automatic Increases had been continued. | | Salary Paid as a Result of Non-Payment of Automatic Increases. | |
|---|---|---|---|---|
| | Nominal Salary under Award Operating prior to Salary Reductions. | With Salaries Act Reduction. | Nominal Salary. | With Salaries Act Reduction. |
| | £ | £ s. d. | £ | £ s. d. |
| 1930-31 .. .. .. .. .. .. | 110 | 99 0 0 | 110 | 99 0 0 |
| 1931-32 .. .. .. .. .. .. | 130 | 110 10 0 | 110 | 93 10 0 |
| 1932-33 .. .. .. .. .. .. | 150 | 127 10 0 | 110 | 93 10 0 |

But, despite sporadic fulminations—fulminations which contain much of the effervescence of youth—the Service as a whole is passing through the severe testing time of adversity with much credit. It has carried on and it will still try to carry on, but the burden should not be made too heavy; stoicism may give way to an all-round pessimism which will beget sullen resentment, with resultant loss of morale and efficiency.

### The One-track Mind.

Every dog has his day, so they say. Even sectional specialists seem to have their day in acute crises, and then—their yesterday. To-day the economists and the engineers are hailed as the world-savers; other experts have done their dash and left the world still sick. A specific disease may call for the specialist; but specialisation connotes restriction, and restriction leads to the one-track mind. But the world to-day is suffering from a series of ills—not one ill only. Economists and engineers are regarded as men of many parts—otherwise of many tracks; hence they are welcomed as men who may put the world back to work. Besides, forward-planning is part of the scheme; and they are the forward-planning experts. May they succeed, and succeed quickly. But when the stage of retrospect has been reached, it will possibly be found that the chief factor in recovery was just sound, simple common sense.

I fear that, apart from sealing-wax and red tape for which he is supposed to have a penchant, the public servant is generally looked upon as a man with a one-track mind. In some respects the assumption is not ill-founded. Certain departments exist for Crown purposes only; they have no counterpart elsewhere; they are isolated units even in a governmental organisation. The employees become highly efficient, in sooth—experts in their special work; to the extent that the work is highly specialised, their official world becomes circumscribed and their departmental outlook tends to contract rather than to expand. Sometimes, too, the characteristics of the work seem to influence the nature of the man. Yet, necessarily,

it may take a long time to master the niceties inherent to the office and to acquire the knowledge and gain the wisdom essential to efficiency. In such cases, the development of a one-track official mind can be understood; and there are compensating advantages. In other cases the disadvantages are acute; there are departments in which activities interlock with the activities of other departments. So far as such activities obtain, these departments should work and move in unison and not as detached fragments. Some do, others do not. The man with the true administrative flair is in touch with many tracks—not one only; his official horizon is Service-wide, not merely departmental. A one-track man in a responsible position in a department of Service-wide ramifications can do much harm to the administration as a whole.

**Service-Regard or Self-Regard.**

There are a few who seem to think that regulations (and even some of the ten commandments) are archaic, and that a form of control should be inaugurated, and a revised decalogue issued, which will conform to what may be termed the ultra-modern vogue. But the few notwithstanding, regulations, like the old commandments, are necessary, and should be honoured in the observance. In Public Service administration, regulations are framed to meet the requirements of the Service—and that is as it should be; the individual should conform to the regulation, the regulation should not be adapted to suit the individual. The code contains an injunction that every officer shall, during the hours of duty, devote himself exclusively to the discharge of his public duties, and shall behave at all times with courtesy to the public, giving prompt attention to all reasonable requirements. There is nothing archaic about that regulation. A public officer should not place himself in a position in which his private and personal interests will conflict with his official duties. Service-regard should transcend self-regard. The code also prohibits officers from seeking the influence or interest of any person in order to obtain promotion, transfer, or other advantage. That prohibition has much to commend it, particularly as another section of the code prescribes that promotion is to be determined by efficiency and seniority.

**The Braying Vicar.**

There is more of the sombre than the gay in the official life of some of the Service heads. But incidents at times provide them with welcome interludes of amusement, even though it be tinged with a little cynicism. Events may involve a change of Ministerial chiefs; then a certain order of vicars who always seem to toss with a double-headed coin reappear. The new Minister is told tales of wrongs which have been inflicted by official tyrants; it may be unfair reduction in status, unwarranted withholding of promotion, deprivation of privileges, and so on. Then comes the very natural call for reports. But, as officials are not retainers of either the Montagues or the Capulets, but are servants of the Crown, and are (or should be) unbiased in their administration and just in their decisions, the process of unmasking the vicars is not usually a difficult one. Be it said, too, that the reports generally reveal that the vicars themselves have been more sinning than sinned against.

But many of them are optimists; they will bide their time; they will come again.

**Administrative Pioneering.**

Some aspects of Public Service administration are like pioneering—a hard slog and a long slog. The blazing of the track which leads to reform is often far from easy; winkleism and prejudice, with a colouring of jealousy, are as hard to overcome in their way as the jungle. But, then, the Public Service is not alone in this respect: think of the Australian wool and meat industries. On annual speech days it is apposite to talk of the traditions of the old school, to remind the boys of to-day that they will be the men of to-morrow, and to exhort them to keep the school flag flying. But when reform is mooted in the counting-house, one sometimes longs for a little less of tradition and a little more of progressive thought. The departmental caveman was loth to change tomes for cards, nibs for typewriters, ledgers for loose leaves, penwork for accounting machines. But the changes came; slowly in some directions, but ultimately they came. The attempts at the reorganisation of the agricultural industry are still in one's mind. A decade ago a detailed inspection of the Agricultural Department revealed very plainly that the marketing end of agriculture, even more than the growing end, needed to be organised on sound lines, and recommendations for reorganisation were made. Many forecasted, however, that merely a crop of tares would result. But what of to-day! Even the unassuming peanut has become famous. Because

of the decision in the Peanut case, there was a fear that commodity boards, fruits of agricultural reform, might perish; hence a rush to save them. Thus, after all, agricultural reorganisation has proved to be worth while. And so it was with rural schools; when the first rural school was outlined and planned, bumbledom and much of officialdom jeered; patience and doggedness were needed to win through. Now there are many in the land who would rather abolish some of the secondary schools than lose the rural schools. Indeed, the educational cry of the hour is for more rural schools. Nevertheless (and disrespect of the Ancient is not intended), there is room both for Horace of the classics and for Horace of the studbook, but each of his own sphere. Keep Horace of the classics to the classics and the things which pertain to the classics; but let the farm have its own Horace. Just as it is not thought wise, nationally, to mix colours, neither is it wise to mix Horaces. Yet it takes a lot to convince some people. A Public Service Commissioner is neither omniscient nor omnipotent; but time tells.

### The Right of the Female to Work.

The subjects of female employment and equal pay have been discussed freely during past months. With me, equal pay is a story for another day—perhaps in the Industrial Court. But, as the Crown is the largest employer of females in the State, the expression of a few thoughts on that subject may be timely. Apart from the scientific, higher technical, and manual sections, which are staffed almost exclusively with males, Public Service administration (exclusive of teaching) may be divided broadly into four sections—higher administrative, lower administrative, major detail, minor detail. The first three sections embrace what are known as the classified positions and the last section comprises the routine positions. The number of females holding classified positions (exclusive of teaching sections) is negligible. The minor detail section includes routine clerical work, typing, filling in of card records, card indexing, sorting, and the like. Females are very suitable for much of this class of work, and its salary-value is not high. Care is taken as far as possible that, even in the minor detail section, males are allotted the work which leads to the higher positions, and the fact that classified positions are held almost wholly by males is proof of that statement. Typewriters, dictaphones, table telephones, and accounting machines of various kinds have displaced much penwork, and, generally, females are very proficient operators. The greater the development in machine work the greater will be the tendency to employ females on such work. So is it in the Teaching Service—the section which absorbs most of the female employees. As both boys and girls have to be taught, females must be employed as well as males. And many educationists contend that, in the lower classes at least, females are even better suited for the work than males. I should not care to take the responsibility of submitting a recommendation to the Government that the stenotypists and the female teachers be dispensed with and their places be filled by males. Many of these females, too, not only have to support themselves but have to contribute to the family income. But does not the question of the restriction of female employment raise the even wider question of the whole Education system? If the employment of females is to be restricted, should not the Education system be recast, seeing that at present it is based on the principle of co-education? Scholarships, for example, are stepping-stones to employment; if, then, the employment of females is to be restricted, should the system of State scholarships—two-year, Extension, and University—be continued on the existing equal basis? Does not restriction in the one direction connote restriction in the other direction; then, too, would not the further question arise as to whether the present expenditure on the education of females, particularly higher education, is warranted? Female education, female employment, equal pay—another form of the eternal triangle.

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*A JOURNALIST'S APPRECIATION.*

*The managing editor of an important Southern publication writes* (18/9/33):—"*. . . I find your Journal most interesting and instructive.*"

# OUR EXPORT TRADE WITH BRITAIN.

## ACTING AGENT-GENERAL'S REPORT.

*In his annual report to the Premier and Chief Secretary (Hon. W. Forgan Smith), the Acting Agent-General for Queensland in London (Mr. L. H. Pike) has included a valuable review of our export trade in primary products with Great Britain, and from which the subjoined extract has been made.*—ED.

### TRADE AND COMMERCE.

REVIEWING the history of the economic development during 1932, the outstanding feature of the year has been the altogether unprecedented low rates of interest for money. This was the direct result of reduced industrial activity, and of the difficulty in finding profitable and safe employment for capital, thus enabling gigantic conversion operations to be carried out by the Government.

The most remarkable event of the year has been the adoption in this country (Great Britain) of the policy of protective tariffs. It is obvious that the Government had no choice but to follow the example of all other nations, and for the time being this change can be looked upon as inevitable, both for the purpose of protection and to assist in making up the deficiency in the yield derived from direct taxation—a field which has been exploited to its utmost possibility.

It is hardly necessary to dwell on the impediments placed in the way of international trade by exchange restrictions and other regulations imposed by an increasing number of countries to check the export of capital. Until these irksome restrictions can be withdrawn, and the other international barriers and prohibitions have been lowered or removed, it would be useless to look for a return to sound trading conditions.

The Board of Trade returns of the imports and exports of the United Kingdom show a big contraction in turnover, as in the case of all other nations. This, however, must be mainly attributed to a reduction in values rather than in the volume of trade. The visible adverse balance has been reduced from £406,000,000 in 1931 to £286,000,000 in 1932, the lowest since 1913, which is the direct outcome of the fall in sterling and import tariffs. These figures would appear to indicate a considerable improvement in the financial position, but it must not be overlooked that the invisible favourable trade balance must have suffered seriously from the reduction in dividends received from foreign investments, and as the result of the falling off in freight earnings of the shipping companies.

### SUGAR.

The Chancellor of the Exchequer in his Budget Statement of 1932 announced an increased preference of 1s. per cwt. on all Colonial sugars entering the United Kingdom market during the next five years. He also explained that a special supplementary preference of 1s. per cwt. for five years on a limited quantity of Colonial sugar would be granted on the allotment of certificates by the Colonial Office among the sugar-producing colonies in proportion to their total exports. The two preferences are liable to adjustment and gradual disappearance in the event of the price of sugar rising above a certain figure.

The duties on Dominion and foreign sugars were not altered in any way.

As this decision of His Majesty's Government involved a new principle of differentiation between Dominion and Colonial sugar suppliers, under instructions from your Government, representations were made by me to the Secretary of State for the Dominions with a view to clarifying the position. I subsequently submitted full and complete reports to you on this important question, and all I need say here is that His Majesty's Government indicated in reply that the special concessions mentioned above were given on account of the exceptional circumstances of the sugar

industry in certain colonies, for the support of which the Government in the United Kingdom was ultimately responsible. It was stated—

> "That the complete ruin of this industry would involve a direct charge on the United Kingdom taxpayer, who would be obliged to provide from voted monies grants for the relief of unemployment and the maintenance of administration. It was decided in these circumstances that the financial consideration involved made it quite impossible for the concession to be extended to the Dominions."

I was present at a deputation from the Sugar Federation of the British Empire which waited upon the Chancellor of the Exchequer in March, and urged upon His Majesty's Government the advisability of increasing the duty on foreign sugar entering the United Kingdom market. The Budget which followed in April did not adopt this proposal.

At the suggestion of the Queensland Sugar Board, and with the approval of the Commonwealth Government, your Government instructed me to attend the Imperial Economic Conference at Ottawa. I made arrangements accordingly, and on my return to London submitted to you a full and lengthy report on the results of my mission. The outcome of the Conference may be summarised here by recording that the existing preferential margin on sugar granted in the United Kingdom market is now stabilised until August, 1937.

The London brokers, acting as agents for the Queensland Sugar Board, again negotiated a contract for the exportable surplus, and altogether a total quantity of approximately 188,000 tons of sugar was shipped during the period from June, 1932, to January, 1933. Of this quantity some 50,000 tons went to Canadian refiners. It is understood that this year the Canadian refiners have made no complaints, and it may be assumed therefore that Queensland raw sugar manufacturers have now succeeded in making an article suitable to the requirements of these buyers.

During the past few months negotiations have been proceeding between United Kingdom refiners and beet interests in order to arrive at some basis of rationalisation of the whole sugar industry, with the object of doing away with the price-cutting competition which for the past few years has been in operation, particularly during the months of the beet campaign, which happen to coincide with the arrival in this country of Queensland sugars. As these negotiations have been undertaken, it is understood, with the sanction and approval of the Imperial Government in relationship to the expiring beet subsidy, it is confidently anticipated that should any definite scheme be evolved within the industry, this would form the basis of future Government action, in which case no doubt some indirect advantage would accrue to the Queensland industry.

As a result of the revised British preferential scale of duties, larger quantities of Queensland and Natal sugars have been diverted to the Canadian market. On the other hand, increased supplies of British West Indies sugar have been consigned to Great Britain.

The total supplies of British preferential sugars available in 1932 exceeded those of the previous year by about 70,000 tons; entries into the United Kingdom and Canada were respectively about 100,000 tons more and 30,000 tons less than during 1931.

The sugar market during the past year has been a source of great disappointment to the producer practically all over the world, and in countries like Cuba and Java to such an extent that in the former the present crop has been restricted to 2,000,000 tons, and, in the latter, plantings to be begun in the near future (for the 1934 crop) are expected to be for a crop of not exceeding 500,000 tons. These are the two principal countries which produce sugar almost entirely for export, but more or less the same conditions obtain in countries having a home consumption of importance, such as, *e.g.*, the European beet countries and Formosa. The production of Formosa in 1931-32 was 1,147,000 tons; in 1932-33 it is estimated to be under 700,000 tons.

During the year I had conversations with Mr. F. E. Powell, the chairman of the International Sugar Council (Chadbourne Scheme), who desired to know whether Australia would co-operate with the countries adhering to the Chadbourne Agreement by adopting a much more ambitious scheme of restriction of production. Our discussions were very cordial, and after I had explained the position from Queensland's point of view I referred the matter to Brisbane. Although Mr. Powell was, I think, satisfied with my explanations regarding our present safeguards against increased production (*i.e.*, the peak-year scheme and the assignment of areas), I would urge that every precaution be taken to guard against the impression gaining ground in the United Kingdom or elsewhere that Queensland is not alive to the dangers of over-production. In this connection emphasis should be placed upon our desire rigidly to

enforce the present regulations against extension of the area under cultivation, with a view to assisting in the general desire to bring the industry back to an economic basis.

Appendix "B."—A chart indicating the movements of sugar prices during the year is given in Appendix B. From this it will be seen the record low price of 4s. 2d. per cwt. was recorded in April.

## WOOL.

To all concerned, whether engaged in production, distribution, or consumption of wool, 1932 has in most cases been a most difficult and trying year.

In Great Britain, at the end of 1931, the imposition of 50 per cent. duties under the Abnormal Import Act gave a temporary stimulus to the market at the beginning of the year, and prices began to show some inclination to improve. In April, however, although the British Government confirmed its policy of protection, duties on woollen manufactured goods were reduced to 20 per cent. and 10 per cent. on wool yarns, and this led to further disturbance of trade in Great Britain without material benefit to those engaged in wool manufacture in Continental countries, where the revised duty, plus adverse exchange, was quite sufficient to continue to shut out imports in Great Britain.

It has rightly been regarded with satisfaction that, in spite of the world economic crisis, wool has gone steadily into consumption, and, unlike many other commodities, stocks have not up to now accumulated to any large extent. To countries still on the gold standard wool is a very cheap commodity, and it is not surprising therefore that countries like France, Germany, Belgium, and Holland have continued to absorb large quantities. Constant and rapid changes in the exchange value of sterling, however, have necessarily affected the market, and have been responsible for many minor fluctuations.

There has been an extremely poor demand for low crossbred wools, and one of the urgent needs of the industry at present would appear to be a new outlet for this class of material. There is a large accumulation of it available at low prices—a situation largely due to the reasonable values of the finer wools, which have popularised them at the expense of the lower qualities. It is not healthy for the industry when certain wools are in demand to the detriment of other sorts, and an increased call for coarse crossbreds would bring more stability to the trade.

There were seven series of sales in London during the year, and clearances proved reasonably good. Throughout the series there was keen competition from Continental countries, which, with the depreciated pound, found wool very cheap and apparently irresistible. France took an extraordinary amount, and Germany bought well in the crossbred sections. It was fairly late in the year when the home trade came into the market to its greatest extent.

Combing wools at the sales have remained fairly steady. Good 64's fleeces made about 18½d. clean scoured at the beginning of the year. They declined somewhat during the first few months, and touched their lowest point (16½d. to 17d.) at the May-June series. The July sales showed an upward trend again to about 18d., and they reached about 19d. at the September series. The improvement was partly the result of confidence inspired by the success of the British War Loan Conversion and the agreement between the Governments represented at the Conference at Lausanne. A slight fall was recorded at the November sales, when they settled down to 18½d.

Other qualities followed a similar course to that of 64's. At the beginning of the year 56's fine crossbreds made about 15d. clean scoured. At the May-June series they fell to about 12½d., rallying again to 15d. at the September sales, and maintaining that level at the last series in November.

The invention of new textile fibres during the year brought a strong protest from the Wool Textile Delegation against the use of the term "artificial wool." The delegation contended that no product deserving the name of wool, artificial or otherwise, existed apart from its growth on the sheep. They believed there was a serious danger of the public being misled by such terms, and urged that publicity should be restricted to the use of terms which could be scientifically justified and well understood.

The woolgrowers in Australia continue to be represented in London by Mr. Walter P. Devereux, and his weekly reports by cable and his fortnightly letters that are published in the Australian press keep those concerned in Australia in touch with the movements in markets and the course of events in Europe.

*Wool Packs.*—Experiments have been continued by the Wool Industries Research Association with a view to obtaining a suitable wool pack. Several experimental

packs made of Scottish jute, some impregnated with cellulose and others with rubber latex, were sent to Australia and submitted to a thorough examination on their return to this country. The packs treated with cellulose proved to be more satisfactory than those treated with rubber, but both are said to be promising. It is understood that the cost of the treatment is small, and the mechanical process is simple and inexpensive.

In addition to the determination of the efficiency of the "dopes," the experiments were carried out with a view to ascertaining whether the total weight of the pack could be materially reduced. It would appear, however, that no real saving can be made on the weight of the fabric if the strength and durability are to remain unimpaired. Further experiments are now being made with packs made of material obtained direct from Calcutta.

## MEAT.

The estimated total consumption of beef, mutton, and lamb in the United Kingdom last year was—

| | Tons. |
|---|---|
| Beef .. .. .. .. .. | 1,288,529 |
| Mutton and lamb .. .. .. | 650,324 |
| Total .. .. .. | 1,938,853 |

Of this total, 56.28 per cent. was imported and 43.72 home-grown. Australia's contribution was 47,879 tons of beef and 57,802 tons of mutton and lamb, representing 9.60 per cent. of total importations and 5.45 per cent. of total consumption. The importations of chilled beef from Argentine amounted to 390,332 tons, which represents 35.47 per cent. of the total importations and 20.13 per cent. of the total consumption. New Zealand exported to this country last year 28,944 tons of beef and 195,793 tons of mutton and lamb, representing 20.41 per cent. of total importations and 11.59 per cent. of consumption.

According to a report issued recently by the Empire Marketing Board, there has for the past few years been a downward tendency in beef consumption, and a swing over to pork and mutton, both in countries which normally consume more beef than pork and in those where pork is always the more popular meat—chiefly North America, Germany, and some other countries of Northern Europe. Between 1925 and 1930 beef and veal consumption in the United States fell from 71 to 57 lb. per head, while pork and lard rose from 81 to 82 lb., and mutton and lamb from 5¼ to 6¼ lb. per head. In the United Kingdom beef consumption fell from 72 to 66 lb., while pig meat and mutton rose respectively from 39 to 43 lb. and from 26 to 28 lb. In Canada beef fell from 70 to 68 lb., while pork rose from 72½ to 81½ lb., and mutton and lamb from 5 to 7 lb.

*Beef.*—The imports of beef into the United Kingdom during the past three years were as follow:—

| From— | Chilled Beef. | | | Frozen Beef. | | |
|---|---|---|---|---|---|---|
| | 1930. | 1931. | 1932. | 1930. | 1931. | 1932. |
| | Cwt. | Cwt. | Cwt. | Cwt. | Cwt. | Cwt. |
| United States of America .. | .. | .. | .. | 45,959 | 60,297 | 47,466 |
| Brazil .. .. .. .. | 506,976 | 598,664 | 481,090 | .. | .. | .. |
| Uruguay .. .. .. .. | 866,685 | 778,437 | 502,556 | 276,114 | 239,359 | 197,293 |
| Argentine Republic .. .. | 7,713,349 | 7,911,175 | 7,806,632 | 750,082 | 658,972 | 655,431 |
| Australia .. .. .. .. | .. | .. | .. | 796,984 | 1,136,278 | 957,589 |
| New Zealand .. .. .. | .. | .. | .. | 311,220 | 382,178 | 578,881 |
| Other Countries .. .. .. | .. | .. | 10,136 | 310,591 | 215,182 | 128,790 |
| Totals .. .. | 9,087,010 | 9,288,276 | 8,800,414 | 2,490,950 | 2,692,266 | 2,565,450 |

The quantity of frozen beef imported from Australia was less by 6,340 tons than in 1931, and approximately the same amount represents the difference in the total importations from all countries for the two years.

The year opened with Australian hinds at the low level of 3¼d. and crops at 2⅝d., at about which prices they remained, with slight variations, until the beginning of April, when the quotations rose to 4¼d. for hinds and 4d. for crops. This proved to be highest for the year, and from June onwards values again receded until December, when they stood at 3⅞d. for hinds and 3¼d. for crops.

South American chilled beef followed much the same course, opening at 5½d. for hinds and 2½d. for fores and closing at 5⅞d. and 3⅜d. for fores.

Several trial shipments of Australian chilled beef arrived in the United Kingdom during the year, and, although the results were inconclusive on the whole, they gave promise that with further experience and a more complete knowledge of the problem from the scientific aspect the present difficulties of shipping chilled beef will be overcome in the not far distant future.

Apart from chilling possibilities, the basic problems confronting the industry remain the same—namely, that in order to place our export industry on a sound basis we must (1) improve our herds; (2) shorten the transport conditions; (3) arrange a regular flow of beef to the British market; and (4) land our meat at competitive prices, and in a condition equal to chilled Argentine.

*Mutton and Lamb.*—The total quantity of mutton and lamb imported into the United Kingdom in 1932 was 348,212 tons, as compared with 355,364 tons in the previous year—a decrease of 7,152 tons. The shipments from New Zealand were increased by 25,305 tons, whilst those from Australia and South America were reduced by 18,665 tons and 14,409 tons respectively.

The following table shows the imports of frozen mutton and lamb from all sources during the past three years:—

| From— | 1930. | 1931. | 1932. |
|---|---|---|---|
| | Cwt. | Cwt. | Cwt. |
| Uruguay .. .. .. .. .. .. .. .. | 423,327 | 284,300 | 163,690 |
| Argentine Republic .. .. .. .. .. .. | 1,452,043 | 1,553,309 | 1,385,720 |
| Australia .. .. .. .. .. .. .. .. | 810,170 | 1,529,345 | 1,156,034 |
| New Zealand .. .. .. .. .. .. .. | 3,292,842 | 3,469,761 | 3,915,865 |
| Other Countries .. .. .. .. .. .. .. | 406,526 | 270,564 | 342,938 |
| Totals .. .. .. .. .. .. | 6,384,908 | 7,107,279 | 6,964,247 |

Prices of mutton and lamb remained fairly steady until July, when there was a sudden drop, and values remained low until December, when there was an appreciable recovery. The following were the prices in London of the various descriptions at the beginning and end of the year:—

| — | New Zealand Mutton. | New Zealand Lamb. | Argentine Mutton. | Argentine Lamb. | Australian Mutton. | Australian Lamb. |
|---|---|---|---|---|---|---|
| | *d.* | *d.* | *d.* | *d.* | *d.* | *d.* |
| 1st January, 1932 .. .. | 3⅞ | 7¼ | 3½ | 5½ | 2⅞ | 5¼ |
| 30th December, 1932 .. .. | 4½ | 6½ | 3¾ | 5¼ | 3½ | 5⅝ |

*Pork.*—The number of pigs imported into this country in 1932 was 35,257, as compared with 68,993 in 1931. This decline is probably accounted for by the low prices realised, which are given below for porkers on a monthly average basis—as taken from the official price lists of the Imported Meat Trade Association:—

| | Per lb. | | Per lb. |
|---|---|---|---|
| | *d.* | | *d.* |
| January .. .. | 4⅜ | July .. .. | 4½ |
| February .. .. | 4⅞ | August .. .. | 4⅝ |
| March .. .. .. | 5 | September .. .. | $5\frac{1}{16}$ |
| April .. .. .. | 5¼ | October .. .. | 5 |
| May .. .. .. | 5⅛ | November .. .. | 5⅛ |
| June .. .. .. | $4\frac{11}{16}$ | December .. .. | 5¾ |

There has been a marked improvement in quality, and grading is being carried out in a careful manner.

It has been suggested that it would be interesting to have competitions in Australia similar to those held in New Zealand, where Agricultural Associations have special export porker and baconer classes at their annual shows, when prizes are awarded for the most suitable export pigs. These are afterwards killed and shipped to the United Kingdom, where further prizes are awarded, and full reports issued both in writing and by photographs to each exhibitor.

The baconer class would particularly benefit by some further improvement, as complaints have been made that there is an excess of fat on this class of pig. If proper attention is given to producing a leanish baconer—say, with from ¾ in. to 1 in. of fat on the back for carcases up to 160 lb. range, and with a streak full of meat—a much larger export business with this country is possible, especially in view of the "bacon" restrictions now in force here.

Appreciation is expressed at the way in which the Brisbane Abattoir continues to turn out a clean, white, flesh-coloured carcase, which on average is finished better than many others seen from Australia.

Unfortunately, unless there is a very marked improvement in world commodity values, producers cannot look forward to greatly improved prices, although there is ample oportunity for marketing both baconers and porkers in increased quantities.

## COTTON.

The outstanding event in the cotton industry of this country was the settlement, towards the end of the past year, of the disputes which had been prevalent for some years past.

In this, as in every year since 1920, the industry realised that it had to meet growing competition from India, Japan, and other countries, and it made strenuous efforts to overcome it. The latest is an organised attempt to secure increased preferential rates for British goods in British Dominions and Colonies.

Supplies of raw cotton were abundant, the imports for the year totalling 12,521,767 centals for 100 lb., as compared with 10,906,188 centals in 1931. The shipments from the United States to this country amounted to 7,251,783 centals, as against 4,421,810 centals in the previous year, while those from Egypt in 1932 were 2,410,929 centals, compared with 2,558,408 centals in 1931. The quantity imported from British countries totalled 1,332,502 centals, of which Africa contributed 780,800 centals and India 538,660 centals. Only a negligible quantity (about 189 bales) reached this country from Queensland.

The American cotton crop for the season 1931-32 was the second largest on record, the total of 16,877,000 bales being only surpassed in 1925, when 17,570,000 bales were marketed. Last season's crop was the product of 40,693,000 acres, as compared with 47,087,000 acres in 1925. The yield per acre was 201·2 lb., as against 147·7 lb. in the previous season and 155·0 lb. in 1929-30.

Prices generally tended low until August, when there was an upward turn in virtually all commodity prices. The best levels reached during this movement were not held, and a period of uncertainty followed, the war debts situation exercising a depressing influence until the middle of December, after which the markets had a somewhat stronger undertone. The spot price of middling American cotton at Liverpool was 5·34d. at the beginning of January, falling to 4·08d. on 2nd June, recovering to 7·20d. on 6th September, and relapsing to 5·29d. on 30th December.

The following table shows the price in pence per lb. of the two most widely used qualities of cotton on a late settling day of each month:—

| 1932. | Mid-American. | Fair Egyptian. | 1932. | Mid-American. | Fair Egyptian. |
|---|---|---|---|---|---|
| | d. | d. | | d. | d. |
| January .. .. .. | 5·53 | 7·35 | July .. .. .. | 4·50 | 6·85 |
| February .. .. .. | 5·91 | 7·65 | August .. .. .. | 6·93 | 9·15 |
| March .. .. .. | 4·95 | 6·80 | September .. .. | 6·08 | 8·70 |
| April .. .. .. | 5·00 | 6·75 | October .. .. .. | 5·56 | 7·81 |
| May .. .. .. | 4·32 | 5·80 | November .. .. | 5·35 | 7·27 |
| June .. .. .. | 4·43 | 6·25 | December .. .. .. | 4·97 | 6·82 |

Cotton has not been cheaper for a decade. Ten years ago American growths were over 1s. per lb. and Egyptian varieties soared to over 2s. 6d. To-day cotton maintains its reputation as the cheapest and the most durable of light clothing, and has lost none of its popularity. The manufacturing industry, however, has suffered from over-production, the British trade to an exceptional extent, as its costs of production have been higher than those of its competitors—in some cases 25 per cent. more. Ten years ago Lancashire was responsible for 75 per cent. of the world's exports of cotton, and held predominance in 600 markets all over the world. Since then, owing chiefly to foreign competition, the number of operatives employed in the Lancashire mills has declined by no fewer than 150,000, and hundreds of mills have

been closed. Meanwhile, the Indian mills have doubled their output, and the Japanese cotton industry has made enormous strides, not only in India but in most of the other large cotton-consuming countries of the East.

As already stated, only 189 bales of Queensland cotton came on to this market last year. Generally speaking, they were not equal to the average quality of previous consignments, and appeared to be the tail-end of the crop. They found a ready sale, however, at market prices.

## FURS.

Prices of all descriptions of furs remained at a very low level during the past year, and, so far as Australians were concerned, interest was centred in opossums. There was practically no market either here or on the Continent for either scrub wallaby, kangaroo swamp, rooks, coastal wallaby, or whiptails, and there is no immediate prospect of an improvement.

At the spring sales in April there was very little competition for Australian skins, and, although the best colours realised a slightly higher price than at the previous sales, there was an average reduction of 7½ per cent. During the summer but, with the financial crisis in America and the internal difficulties in Germany, the end of the year the American demand fell away, with the result that at the sales in October a large part of the offering was withdrawn—the skins sold fetching about the same price as at the April sales.

The stocks in London of Australian opossums at the end of the year were about 450,000, of which rather less than half were Queensland, which was not unduly large, but, with the financial crisis in America and the internal difficulties in Germany, the future prospects are so unsatisfactory that fur brokers and merchants here advise strongly against permission being given for the killing of opossums during 1933, as prices will undoubtedly prove unremunerative to trappers.

## BUTTER.

The total imports of butter into the United Kingdom in 1932 amounted to 422,455 tons, as compared with 403,003 tons in 1931—an increase of 19,452 tons. Denmark is still the largest exporter with 129,183 tons. Australian shipments totalled 91,462 tons—an increase of 13,565 tons over the previous year. Queensland contributed 29,780 tons, as against 31,724 tons in 1931—a decline of 1,944 tons. The imports from New Zealand, amounting to 109,516 tons, exceeded the previous year's total of 96,280 tons by 13,236 tons.

The Board of Trade returns give the following figures of the importations of butter into the United Kingdom during the past two years:—

| From— | Quantity. | | Value. | |
|---|---|---|---|---|
| | 1931. | 1932. | 1931. | 1932. |
| | Cwt. | Cwt. | £ | £ |
| Soviet Union (Russia) | 404,369 | 322,887 | 1,969,244 | 1,234,873 |
| Finland | 254,071 | 216,620 | 1,486,898 | 1,080,170 |
| Estonia | 125,384 | 83,153 | 666,984 | 337,916 |
| Sweden | 211,733 | 175,723 | 1,272,517 | 391,742 |
| Denmark | 2,466,070 | 2,583,664 | 15,639,722 | 13,924,927 |
| Netherlands | 96,117 | 46,998 | 598,349 | 248,616 |
| Argentine Republic | 373,934 | 390,445 | 2,047,282 | 1,661,995 |
| Irish Free State | 381,028 | 314,635 | 2,111,488 | 1,433,770 |
| Australia | 1,557,952 | 1,829,254 | 8,350,206 | 8,753,284 |
| New Zealand | 1,925,611 | 2,190,338 | 10,773,553 | 11,151,310 |
| Other Countries | 263,799 | 295,391 | 1,381,342 | 1,262,458 |
| Totals | 8,060,068 | 8,449,108 | 46,297,585 | 41,481,061 |

The fall in values the previous year has been accentuated during the period under review. During January the prices of Australian butter ranged between 90s. and 110s. per cwt. There was a slight improvement from February to April, when quotations again fell and remained, with some fluctuations, at between 88s. and 98s. until October, when there was a further decline until the end of the year, the closing prices being 78s. to 85s. for salted and 78s. to 88s. for unsalted.

Reports continue to be received of the excellent position which Queensland butter has secured in public favour. The quality and colour appeal to buyers of fancy quality, with the result that it has a somewhat higher selling capacity than the produce from other States on this market.

At the competition for Dominions butter, held in connection with the Annual Show of the British Dairy Farmers' Association in London last October, Queensland entries were successful in securing the whole of the prizes (five) in the "Salted" class, and first and third prizes in the "Unsalted."

A report of considerable value to the Queensland dairy industry has recently been issued by the Privy Council Medical Research, giving the results of exhaustive investigations which have been carried out into the vitamin content of Australian, New Zealand, and English butters.

Copies of this report have been forwarded by me to Queensland, but I consider it of sufficient importance to give here the following quotation:—

> "The result of chief public interest which emerges from the investigations just described is the high and uniform vitamin potency of Australian and New Zealand butters. The systematic observations recorded here, together with the published results of isolated tests by others, leave no doubt that the Australian and New Zealand butters when they reach the consumer in this country contain both vitamin A and vitamin D to a value as high as that of butters produced in Great Britain or elsewhere in Europe. It is known that the vitamin content, and especially the vitamin D content, of milk and butter produced in northern latitudes declines in winter, when sunlight is deficient and the herds are stall-fed, and that it rises again in the summer. The Australian and New Zealand butters do not fall short of the best summer butters here, or even of butters produced from cows whose diet has been fortified by an artificial supply of the fat-soluble vitamins A and D. The results now presented, moreover, show that the methods of production and handling, and the delay in transit, have a negligible influence upon the vitamin content of butters as they reach the consumer.
>
> "This good and uniform potency of the Australian and New Zealand butters makes them a particularly valuable source of the vitamins A and D for the British population, and especially during the winter season, when the vitamin potency of home or other European butters may be low.
>
> "It has been shown that the racial origin of the dairy cows providing the butter has no significant effect upon the vitamin content, and it has been shown also that the butters from different parts of Australia are closely equivalent in value.
>
> "It is satisfactory to find that these vitamins in butter have remarkable stability during cold storage. Not only is there no appreciable loss of potency during the weeks of transit by sea, but in several cases no notable loss could be detected even after periods up to two years, and this stability was found whether the butter was stored in large or small quantities, or, again, whether the butter had been prepared from sweet or acid cream. No fear need be entertained, therefore, that the vitamin content of Australian and New Zealand butters is likely to diminish during the period of two or three months which usually elapses between their first preparation and their final consumption in this country."

I recently visited a large industrial centre in the County of Durham, in Northern England, and took the opportunity of studying retail conditions in the sale of primary products. In view of the serious fall in the price of our butter, I was particularly interested in the retail selling prices of this commodity, and in ascertaining the relative demand for Empire and foreign butters in a typical industrial centre of Northern England, where unemployment was said to be approximately 50 per cent. of the adult population. Needless to say I was much surprised to find Danish butter on sale at practically every grocer's store and prominently advertised as such, although the selling price was from 2d. to 3d. per lb. higher than for the Empire article. In a few shops New Zealand butter was on sale, but in no single case could I see Australian butter on sale as such. On inquiry, I did discover Australian butter being sold, although not advertised, at a small store, and in conversation with the manager he said the only reason he could give for Danish butter being in such large local demand was because this article had been sold to the fathers and mothers of those of the present generation of housewives, and this in spite of the fact (as he admitted) that Australian butter was so much cheaper and generally of equal or better quality and value. He pointed to the fact that Danish butter also contained more moisture, for which the purchaser had to pay. The retail prices I found were:—

| | |
|---|---|
| Danish .. .. .. .. | 11d. to 1s. per lb. |
| Australian and New Zealand .. | 9d. to 10d. per lb. |

*Wood Taint in Butter.*—There have been practically no complaints of wood taint from importers of Queensland butter during the past year. Although consignments of butter still arrive in which wood taint can be detected, on the whole it has been very little in evidence. A quantity of butter has been received during the season packed in Queensland Kauri timber, and on no occasion has there been any marked taint in butter thus packed.

Experiments have also been made with the insides of boxes treated with a casein solution, and, so far as it has been possible to judge, this method of dealing with the problem has been very satisfactory.

## CHEESE.

The total imports of cheese into the United Kingdom during the past year amounted to 150,327 tons, as compared with 144,289 tons in 1931—an increase of 6,038 tons. New Zealand exceeded her previous year's shipments by over 6,000 tons, with a total of 92,637 tons. Although the exports from the Commonwealth exceeded the previous year's total by 275 tons, Queensland's contribution of 1,926 tons was 300 tons less than in 1931.

The following table, issued by the Board of Trade, shows the quantity and value of cheese imported into the United Kingdom during the past three years:—

| From— | 1930. | | 1931. | | 1932. | |
|---|---|---|---|---|---|---|
| | Cwt. | £ | Cwt. | £ | Cwt. | £ |
| Netherlands | 183,076 | 673,741 | 168,219 | 573,934 | 169,932 | 454,609 |
| Italy | 144,650 | 692,022 | 131,783 | 637,034 | 106,094 | 449,009 |
| Australia | 47,685 | 174,439 | 68,036 | 193,348 | 73,534 | 211,975 |
| New Zealand | 1,960,901 | 7,821,634 | 1,732,620 | 4,947,571 | 1,852,743 | 5,445,397 |
| Canada | 678,294 | 2,699,918 | 706,725 | 2,322,269 | 747,272 | 2,265,429 |
| Other Countries | 97,710 | 541,220 | 78,411 | 388,551 | 56,974 | 273,320 |
| Totals | 3,112,316 | 12,602,974 | 2,885,794 | 9,062,707 | 3,006,549 | 9,099,739 |

The arrivals of Queensland cheese have been somewhat irregular. Commencing with the months of May and June, for five weeks in succession there was none available on the market, and supplies continued very intermittent to the close of the year.

Price levels, as in the case of butter and other primary products, suffered severely, quotations for Australian cheese fluctuating between 48s. and 63s., the higher figure being realised in February, and the lower at the end of December.

The standard of Queensland cheese was well maintained on the whole, but, according to reports received at this Office, the quality of the output of some of our factories is capable of improvement.

It is satisfactory to report that the Downs Co-operative Dairy Association, Lilyvale, was, for the second year in succession, successful in securing the premier award, which includes the Hansen Challenge Trophy, for the best cheese in the competition for Dominion cheese held in connection with the Annual British Dairy Farmers' Association Show at the Agricultural Hall, London.

## EGGS.

The past season is considered to have been a successful one from both the shippers and importers' points of view. Prices did not reach such high levels as in certain periods of the previous year, but, on the other hand, fluctuations were less violent. The producers should, it is thought, be reasonably satisfied with the results, having regard to the much lower prices that have been ruling for other dairy produce and the drop in consumption figures.

Queensland eggs enjoyed a particularly good demand at prices, on an average, about 6d. above those obtained for other Australians, on account of their exceptionally fine quality and selection.

The supplies of imported eggs into the United Kingdom during 1932 fell off considerably, the total decrease as compared with the previous year being over 700,000,000. The imposition of a 10 per cent. *ad valorem* duty was largely responsible for the drop in foreign consignments from Denmark, Holland, Poland, and Belgium. On the other hand, the Australian imports increased by 65·6 per cent., the total reaching 1,514,708 long hundreds, as compared with 918,206 long hundreds in 1931 and 554,653 long hundreds in 1930.

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The fact that such a largely increased quantity of Australian eggs should have been so readily absorbed by the English market clearly indicates their popularity.

With the exception of excessive damage sustained in some of the consignments of the 16-ib. pack, which was investigated and reported upon to the Egg Board by this Office, the Queensland product maintained its excellent reputation for quality, grading, and packing.

Under the Ottawa Agreements Australian eggs retain free entry to the United Kingdom market, the duties on foreign eggs being charged on a flat-rate basis—e.g., first-grade eggs now pay duty at the rate of 1s. 9d. per 120 eggs whatever the market price.

## EGG PULP.

In November last I took occasion to be present at the inspection of the first consignment of Australian frozen egg pulp, which had been manufactured in Melbourne by a new vacuum method. The consignment had been given wide publicity, and the considerable interest aroused was evidenced by the large gathering of trade representatives as well as Commonwealth and State officials who attended the demonstration.

It is well known that egg production in the Commonwealth has seen a remarkable expansion in the last few years, and in view of the increasing export of eggs to the United Kingdom from other countries, and the steady growth of supplies from home production, the question of securing a market for Australian egg pulp as a necessary adjunct to the export of shell eggs has become a matter of considerable importance. The Chinese production has practically dominated the market in egg pulp for years past, the bulk of supplies being used by bakers and confectioners, so that the Australian article is called upon to compete with a powerful influence in this market.

The above shipment was in fine condition both in quality and packing. The pulp was contained in 40-lb. tins, appropriately and attractively labelled, and each tin was protected by a strong waterproof carton—in which respect it is understood to meet with the requirements of the trade. The contents were well emulsified and rich in colour, and the general opinion of those present was that the consignment greatly improved the prospects of securing favourable recognition of the Australian production on the London market, the only difficulty which arises being whether regular and uniformly good consignments can be sent to this market throughout the year—in season and out.

## CANNED PINEAPPLES.

The quantity of canned pineapples imported into the United Kingdom in 1932 was 48,410 tons, as compared with 38,438 tons in 1931.

The imports from foreign countries were nearly 40 per cent. less than in the previous year, probably owing to the 15 per cent. tariff. The position of the Hawaiian trade has been very difficult, and small quantities only have been sold at from 9s. 6d. to 10s. per dozen for Standard. The 1931 Hawaiian pack was about 12,000,000 cases, and owing to the world trade depression a very large quantity was carried over. It is understood that packers agreed to curtail the 1932 pack to 6,000,000 cases. The high prices asked have restricted trade considerably.

About 3,000 to 4,000 cases of pines came to this market from Formosa last year, but it is reported that possibly 50,000 will be available during the present season at prices ranging from 5s. 10d. per dozen for Standard to 6s. 6d. per dozen for Extras. These are, of course, liable to the 15 per cent. duty.

The market price for sliced Singapore pines was 5s. 9d. per dozen, duty paid, for 30-oz. tins. Small tins were obtainable retail for 3½d. and 4d.

The bulk of the trade in Queensland pineapples was done in 30-oz. tins, which were marketed at about 7s. 6d. per dozen for the winter pack and 8s. for the summer pack. There is not a great demand for 20-oz. tins, the prices for which ranged from 4s. to 5s. per dozen. A fair quantity of the 16-oz. size was sold at from 4s. to 5s. per dozen.

The general quality of our pines was satisfactory and met the requirements of the trade.

## FRESH PINEAPPLES.

A small trial consignment of Queensland fresh pineapples was shipped per s.s "Oronsay," which reached London early in November, and was duly inspected by me.

Although this parcel was equal to the best results obtained in previous experimental shipments from Queensland, the fruit could not be compared, from a marketing standpoint, with that shipped to this country from the Azores. The Azores pines sell at from 1s. 9d. to 2s. 6d. each (wholesale), whereas the Queensland fruit is not worth more than 9d. each, which was the price at which this trial consignment was eventually sold to a small buyer.

The pines from the Azores are grown under glass six days' voyage from England, and are shipped as ordinary stowage. They are bright-coloured and fresh-looking, with a firm green foliage at the crown, and are packed in clean wood wool and readily displayed. The Queensland fruit, on the other hand, was packed in a fibre material which had to be brushed and cleaned off before it could be examined. The pines were a dull brown in colour, a few withered leaves only remained of the top growth, and much of the original flavour was lost.

The pineapple is looked upon on this market as a decorative fruit, and, as a selling factor, its appearance is perhaps of equal importance to the flavour, and, unless Queensland pines can be landed here with an undamaged crown and a good colour, it is not likely that they will be able to compete successfully with those from the Azores.

## APPLES.

The experimental shipment of 500 cases of Queensland apples forwarded by the Summit Fruitgrowers' Co-operative Association, Limited, in 1931 was followed last year by another consignment of over 1,100 cases. These were comprised chiefly of "Granny Smiths," "Dunns," and "King Davids," and by arrangement with Messrs. George Monro, Limited, of Covent Garden, I was able to see the fruit soon after its arrival in the market. The condition of the apples was considered, on the whole, to be fairly satisfactory, but, unfortunately, many of the "Granny Smiths" were affected by "Bitter Pit." In the absence of any scientific conclusion as to the cause of "Bitter Pit," various opinions are held regarding the origin of this disease. One merchant with long experience in the trade informed me that the defect was more prevalent with the early-picking crops, and that as the season advances the fault becomes less pronounced. In support of this contention, it was stated that similar trouble was experienced with "Cox's Orange Pippin" from New Zealand until the export of this variety was delayed until later in the year.

A certain amount of wastage occurred through the apples being too tightly packed, particularly those uppermost in the case, which had been cut or bruised by the sharp edges of the lid. The boxes from New Zealand, Western Australia, and some of the other States are lined with corrugated paper, which protects the fruit from direct contact with the wood of the case. This system, I believe, is not adopted in Queensland.

The "Dunns" showed traces of having been stored for some time before packing, as in many instances they had become soft and the skin appeared slightly shrivelled. In respect to this latter condition, I pointed out as a probable cause the abnormally hot weather that was experienced in Queensland at about the time the fruit was being packed.

It is the opinion generally that with the results of this further experiment to assist them the producers should feel confident to export substantially larger quantities in future, and, provided strict attention is devoted to the selection, grading, and packing, Queensland should become, along with her sister States, a regular contributor to the requirements of this market.

## SNAKEBITE AND ITS TREATMENT.

The marks of a snakebite were two punctures, sometimes with two or more scratches. In treating a bite on the hand the first thing was to apply a ligature above the elbow without a second's delay. Next, the place should be wiped and the punctures cut through (along and never across the limb) with a piece of broken glass or a sharp blade. Crystals or permanganate of potash should then be rubbed freely into the cut. After an hour the ligature (which should be twisted with a stick very tightly) must be loosened for 30 seconds. This allowed fresh blood to flow, and unless it was done the flesh might mortify. The loosening and retying of the ligature should be repeated every 15 minutes for another hour. When the ligature was put on within half a minute of being bitten recovery was practically assured.—J. R. Kinghorn (Australian Museum) in the "Sydney Morning Herald."

## PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled for the month of August, 1933 (273 days period unless otherwise stated):—

| Name of Cow. | Owner. | Milk Production. | Butter Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| **AUSTRALIAN ILLAWARRA SHORTHORNS.** | | | | |
| MATURE COWS (OVER 5 YEARS), STANDARD 350 LB. | | | | |
| Heather of Trevor Hill | C. O'Sullivan, Greenmount | 13,482·47 | 577·492 | Prince of Braemar |
| Lucky II. of Wendella | J. Phillips, Greenview | 12,310·86 | 507·129 | Daisy's Westbridge of Glenthorn |
| Broady 2nd of Rosemount | J. Buckley, Rosehill | 10,087 | 440·869 | Gertun of Greyleigh |
| Princess 7th of Oakvilla | H. Marquardt, Chelmer | 11,505·13 | 437·572 | Victory of Greyleigh |
| Duchess II. of Trevor Hill | G. Gwynne, Umbiram | 11,396·5 | 431·723 | Exchange of Balmoral |
| SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | | |
| Rosenthal's Fuchsia 12th | S. Mitchell, Rosenthal, Warwick | 7,945·5 | 325·046 | Dividend of Rosenthal |
| JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | | |
| Rose of Lynfield | F. E. Birt, Sexton | 6,819·5 | 284·306 | Royal Monarch of Blacklands |
| SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | | |
| Duchess of Kalinga | Honey and Braithwaite, Boat Mountain | 7,244·97 | 297·105 | Duchess Jellicoe of Fairfield |
| Fairlie Beauty 20th | C. B. Mitchell, Warwick | 6,902·5 | 295·549 | Fairlie Treasurer |
| Penros Ruth | A. Sandilands, Wildash | 6,797·5 | 261·189 | Bonnie Charmer of Coral Brae |
| JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | | |
| College Sunlight | Queensland Agricultural High School and College, Gatton | 8,108·55 | 318·788 | Fusey's Kitchener of Hillview |
| Penrhos Evelyn | A. Sandilands, Wildash | 6,530·75 | 253·335 | Bonnie Charmer of Coral Brae |
| Euroa Velvet | H. L. Lindenmayer, Binjour | 6,278 | 237·626 | Swagman of Clonagan |

| | | | | |
|---|---|---|---|---|
| **JERSEY.** | | | | |
| Mature Cow (over 5 Years), Standard 350 Lb. | | | | |
| Newhill's Noble Rosina | J. N. Robinson and Sons, Maleny | 5,771·2 | 361·984 | Oxford Golden Noble |
| Senior, 3 Years Old (over 3½ Years), Standard 290 Lb. | | | | |
| Newhill's Golden Queen | J. N. Robinson and Sons, Maleny | 4,955 | 306·013 | Prince Harry of Newhills |
| Senior, 2 Years Old (over 2½ Years), Standard 250 Lb. | | | | |
| Bremerside Golden Buttercup | B. J. Jensen, Rosevale | 6,047 | 354·89 | Kelvinside Noble Chieftain |
| Trinity Popcorn 2nd | A. H. O. Koppen, Peeramon | 5,007·15 | 285·562 | Trinity Perfection |
| Junior, 2 Years Old (under 2½ Years), Standard 230 Lb. | | | | |
| Bellefaire Bonaparte Bon Bellette | F. J. Cox, Imbil | 6,783·1 | 417·183 | Sybil's Bonaparte of Rosel |
| Trecarne Jean | R. A. Slaughter, Clifton | 7,628·25 | 375·253 | Mascot of Brasseldale |
| Trinity Lady Flower | A. H. O. Koppen, Peeramon | 5,874·05 | 326·618 | Trinity Perfection |
| Lucy of Billabong | J. Mollenhauer, Moffatdale | 5,377·62 | 280·887 | Premier of Calton |
| Brooklodge Melba | J. Cummings, Upper Nerang | 4,831·97 | 270·687 | Carlyle Empire Songster |
| Brooklodge Stella | J. Cummings, Upper Nerang | 4,140·74 | 262·718 | Carlyle Empire Songster |
| **FRIESIAN.** | | | | |
| Senior, 2 Years Old (over 2½ Years), Standard 250 Lb. | | | | |
| Oakland's Nelly Rock | W. Richter, Tingoora | 11,633·45 | 437·346 | Pied Rock |

# A QUEENSLANDER ABROAD.

## TRAVELLING RESEARCH SCHOLAR'S REPORT.

*Mr. L. Gordon Miles, M.Sc., a young officer of the Department of Agriculture and Stock, who was awarded a travelling research scholarship in Plant Genetics, and who is now pursuing his studies at the Cornell University, Ithaca, N.Y., U.S.A., makes the following interesting observations in the course of a report to the Under Secretary (Mr. E. Graham).*

VIRGINIA, North Carolina, and South Carolina were visited with the object of seeing something of the cotton and tobacco breeding work in those States.

The places included in my tour were Oxford, N.C. (Tobacco Sub-station), Durham, N.C. (Duke University), Raleigh, N.C. (North Carolina State College of Agriculture), Florence, S.C. (Pee Dee Experiment Station), Hartsville, S.C. (Coker Pedigreed Seed Co.), and Chatham Va. (Tobacco Sub-station). In Virginia and North Carolina the crops were not as yet very far along, while farther South, especially in the neighbourhood of Florence and Hartsville S.C., the tobacco was well along towards maturity, and the cotton was well into flower.

At Oxford the soil was typical of that of a large section of the so-called Piedmont and Coastal Plains areas of the South, being a light-grey sandy soil of relatively low fertility, underlain by clay. All tobacco and cotton is grown with the aid of heavy applications of artificial manure, a complete fertilizer being used. Where tobacco is grown on patches of heavier soil, or where legumes have been ploughed under, high yields are obtained, but growth is rank and quality poor; where no fertilizer is used on the sandy soils, practically no crop results. Plants are commonly spaced 2 ft. in the rows, which are 4 ft. apart.

Magnesium was found to be a limiting factor with tobacco in this area, its deficiency causing the disease known as Sand Drown. Application of Mg. $SO_4$ in lots of up to 80 lb. per acre are commonly made. A favourable response to chlorine in small amounts is also noticed, though larger applications are detrimental to "burn." The work in progress was largely a continuation of former nutritional studies involving a large number of elements and fertilizer combinations. Varietal trials were also being continued over a series of years, and also rotational experiments involving in addition to tobacco, corn, cotton, legumes, and weeds. Little or no breeding work was being conducted at the time, though selection had been practised for a number of years for better yield and quality, and greater uniformity. One or two strains resistant to Thielavia basicola (black root-rot) had also been developed.

Blue mould, here, as elsewhere in the Carolinas, had been little more than a name before 1932, but in this year it became a serious seed-bed pest; vigorous seedlings put out from infected seed-beds, however, apparently recovered, and carried through all right.

Raleigh, my next stop, is the capital of North Carolina, and is located just east of Durham in a flat and rather infertile area. Breeding work at the Agricultural College there consisted mostly of selection out of previously existing varieties—e.g., considerable work had been done on the Mexican Big Boll variety of cotton, and up to 1930 the strain Mexican 6-1-9 was the highest yielding variety over most of the State; by 1933 the newer selections 58-14 and 128 were leading in the Piedmont section, and 58 and 87 in the Coastal Plains. The general recommendations of the station at the present time are Mexican strains for the rolling country of the Piedmont, Coker Cleveland varieties (developed by the Coker Seed Co. at Hartsville S.C.) for the lighter, well-drained soils of the Coastal Plains, and the wilt-resistant varieties, Clevewilt (Coker), and Dixie Triumph for wilt lands. These varieties, under suitable conditions, average $1\frac{1}{16}$ in. staple, and yield over 400 lb. of lint cotton to the acre. The Carolina-Foster varieties are early, light-foliaged, long staple cottons which are recommended only for heavier, poorly drained coastal soils. They generally command a premium because of their $1\frac{1}{8}$ to $1\frac{3}{16}$ in. staple.

Considerable energy has recently been devoted to the improvement of staple length of Carolina cottons. In the past, North Carolina has been producing a surplus of low-staple cotton, while the local market demands much more of the higher staple lengths. For instance, in 1929, the local market consumed only 28 per cent. $\frac{7}{8}$-in. staple and lower, 72 per cent. of the total bales used running higher. The state produced, however, nearly 73 per cent. of the lower staple lengths and only 27 per cent. of the higher. That improvement has been effected is shown by the fact that in 1928 only 20 per cent. of the total crop was $\frac{15}{16}$ in. or higher, while in

1932, 66 per cent. fell into these classes. These improvements are due to better cultural methods, to continuous selection on the part of breeders and seedsmen, coupled with the more general use of improved seed by the farmers, and to prevention of mixtures at the gin. Where farmers wish to obtain their own seed pure from a public gin for planting, the seed roll is dropped, the gin thoroughly cleaned, and the seed caught on the floor. The Extension Department is keenly interested at the time in establishing "one-variety communities," in which all farmers agree to grow seed of the one variety which has been recommended by the College as best for that locality. With careful cultivation, a uniform, high-grade product results, and the troubles of gin mixtures are eliminated.

Under the existing boll weevil conditions, relatively heavy seeding is adopted, hills being generally spaced 8 to 12 in. apart, and averaging two plants per hill. Planting is done in ridges; good results have recently been obtained using hand "cotton hill droppers" of the type sold by Cole Manufacturing Co., Charlotte N.C., or W. F. Covington, Headland Ala. A good stand is obtained, and the work of thinning out is reduced.

At Florence S.C., I visited the Pee Dee Experiment Station and also the office of the Clemson College (South Carolina State) Extension Staff, and was afterwards driven around the surrounding farming country, and saw at close quarters a number of cotton and tobacco farms. One farm in particular had a beautiful stand of tobacco, the whole acreage being planted to one variety—Coker's new Gold Dollar. The dry weather had, however, caused premature yellowing of the lower leaves, and a couple of primings had been made. We also inspected the flue-curing barns, which were in operation at the time, and of which there were ten or a dozen on the farm. The farm supplied all the wood necessary for the fires. A point worth noting was the careful manner in which strips of timber had been left to act as wind-breaks for the crop.

At the Pee Dee Station the blue mould disease of tobacco was occupying the thoughts of the staff very much at the time. Reported only once prior to 1932, it appeared in the seed-beds again in 1932 and 1933. Last year the trouble was restricted to the seed-bed, while this year a number of growers have had considerable trouble in the field. They hesitate to attribute the death of plants in the field directly to the blue mould fungus, and so far have been unable to obtain spores on dead or dying plants in the field. The symptoms, however, looked to me very much like those attributed to blue mould in the field in Australia, and it looks to me as if the disease may yet become a major factor with them here, as it is with us. Some growers obtained excellent stands in spite of heavy seed-bed infection, while others had to replant four or five times in some cases, with the result that a very poor stand was obtained.

The cotton work consisted mostly of physiological, fertilizer, and cultural studies. Cotton is commonly planted here after legumes, and tobacco after weeds. On the light, sandy soils of this area, Calcium arsenate dust (used for boll weevil control) has a cumulative deleterious effect, especially upon following oats and cow-peas.

At Hartsville S.C., the Coker Seed Co. are doing, and have done, probably the best crop-breeding work of any institution in these Southern States.

Here again the major problems in cotton breeding have been those of improving the staple length and spinning quality, and inducing a heavy, early set of bolls, in order to combat the boll weevil. The production of Farm Relief cotton in about 1930 was the result of a cross between a strain of Lightning Express, which possessed the characters earliness, thin foliage, and a staple length of $1\frac{3}{16}$ in., and a Cleveland line possessing large round bolls, storm resistance, good general vigour, and a staple length of $\frac{15}{16}$ in. The desired progenies first appeared uniform in $F_7$ (1928); they combined the thin foliage and earliness of Lightning Express with the boll size and storm resistance of Cleveland, the staple being of good spinning quality, and averaging a good $1\frac{1}{16}$ in. This cotton has hardly been out three years, but has proven very popular over a wide area of the State.

Work has, for many years, been centred on the Cleveland variety, and a number of valuable strains have been evolved by plant-to-row selection. Of these, the Coker Cleveland 5 is the most famous, while No. 884 is an earlier type, but also vigorous and high yielding. Coker Cleveland cottons have won the State-wide 5-acre contests continuously since their inception in 1926. The Coker-Wilds strains were selected for long staple, the resultant lines averaging $1\frac{5}{16}$ in. to $1\frac{7}{16}$ in. staple length. Other long staple varieties have been bred from Delfos and other Delta types, and now go by the name of Coker-Foster, and Delta-type Webber. Successful work has also been done in developing wilt resistant strains, the station being fortunate in possessing some badly infected wilt land. Attention passed from the old Dixie-Triumph lines (out of which they obtained Super-seven) to the better Cleveland types,

and recently the highly resistant Clevewilt has been produced. The problem of physiological strains of the organism has now arisen, and the breeding problem is thus further complicated. Considerable faith was expressed in a cross between the two resistant varieties, Super-seven, and Lightning Express. The $F_2$ progeny strangely shows a large percentage of susceptibility.

The firm's main work in tobacco has been restricted to the testing out of the best available varieties of bright flue-cured leaf tobacco, followed by pedigree selection from the best. In 1928, thirteen leading varieties were tested, and Jamaica Wrapper and Bonanza found to be the best for local conditions. Single plant selections were made from these varieties, and plant-rows set out the following year. One strain of Jamaica Wrapper proved outstanding over the following three-year period, and this, Coker's first pedigreed strain of tobacco was released under the name of Gold Dollar. The tobacco men here are convinced that there is scope for considerable breeding work on cigarette tobaccos; many of the varieties commercially grown lack uniformity. The problem of selection in tobacco is intensified by the fact that all strains are given the same curing treatment, whereas the quality in some may be best developed by a slightly different curing process from that in others. Average curing conditions have to be aimed at, and selection for quality on the basis of one year's test must not be too rigid.

Small grain work has also been carried on for many years, greatest success being achieved in the production of cold resistant and smut resistant oats, both for hay and for grain purposes.

## EFFICIENCY ON THE FARM.

Farm efficiency is applied methodical common sense in the running and management of the farm.

It is, no doubt, a very easy matter to find the faulty or inefficient methods of neighbours, but to put the finger on our own is the thing that we must try to do, and this is one of the objects of the Agricultural Bureau.

Firstly dealing with machinery, many farmers are too busy or hard pushed for time ever to read the instruction book. Careful study of the instruction book will pay very big dividends in the life of a machine.

With internal combustion engines, use only the best oil and greases, for when a farmer has to pay several hundreds of pounds for a machine, it is worth while to put that little difference in price between poor and good lubrication into that machine, for in all cases good lubrication pays.

See that the fuel—whether for car, engine, or tractor—is strained. This, in the long run, will prove a time saver. One may go perhaps for months without trouble through not straining the fuel, and then, perhaps, miss an important engagement, or lose several hours with blocked fuel pipes.

Always clean gauze strainers at certain periods, for even with the best strainers sediments get through.

When emptying oil tins or drums, be careful of the last drop, for it is usually in this that the water and rubbish collects, and unless strained may ruin expensive bearings.

Keep your eyes and ears open, and if you see or hear something wrong, stop and remedy it unless it is trivial, even then it pays, for "a stitch in time saves nine," and nothing is surer than that adage when applied to fast moving machinery.

When feeding cows, pigs, horses, &c., always have the feeding utensils in a convenient place.

Do not leave implements in a far corner of the farm; they may be needed later, and time will be lost in getting any parts or tools that are required.

Take care of any borrowed article and do not forget to return it in the stipulated time or when finished with. It is easier done then than when in the middle of an important job.

Efficiency can be practised in many other ways on the farm, and these are only a few which I have noted. There are many others, and they will all prove time and labour saving.—A. McCallum in a paper at a recent farmers' conference at Morchard, S.A. (South Australia Bureau of Agriculture.)

## FEEDING PIGS.

Freshness and palatability are essential in all pig rations in order to ensure greater digestibility, quicker growth, and maximum returns. Be sure the food is always fresh and appetising.

As indicating the phase of pig-keeping associated with economy of production, recent records from Great Britain indicate that in a series of feeding experiments one sow's litter of nine—a first litter—averaged 200 lb. each at twenty weeks' old. Right up to this stage they averaged 1 lb. gain for a little less than 3 lb. of food. In spite of low prices they should show a satisfactory profit.

Only balanced rations fed on correct lines can produce the standard pig required by the trade to-day. The feeding of pigs along ordinary lines, in which they are given as much milk as can be spared, and in the absence of a sufficient supply the milk is adulterated with water to as much as 50 per cent., is quite uneconomical.

Unbalanced, unreliable, and varied methods of feeding lead to endless trouble. Greater efficiency in feeding and the use of economical balanced rations leads to success and a much greater margin of profit.

The mineral content of the pig's ration should not be overlooked. Experiments have proved on numerous occasions that the number of pigs produced at birth and the strength and vitality of litters can be vastly improved by careful attention to the feeding. Minerals may be given in the form of a powder mixed with the food—in which case each animal receives the proper amount—or they may be provided in the form of a lick which the animal can take as required. In the absence of other minerals a small quantity of table salt added to the rations will improve them and be beneficial to the animal. Excess of salt is dangerous and should be avoided. Iodised mineral salts or mixtures are nowadays available on most markets and are strongly recommended.

A pig breeder writes that he has known of a pig at about six months of age to make no increase in weight for a week or more, and then to gain as much as 20 lb. in the following week. He asks the cause. The answer is that this is probably due to digestive disturbances caused by heavy feeding. It is quite common to have poor gains in the last week or so of special feeding due to indigestion and bowel disorders. The feeding of smaller quantities of food at more frequent and regular periods is suggested as preferable to overfeeding, with attendant risks of loss in weight.

Health, vigour, and bloom represent three very desirable characteristics in the development of profitable pigs. They need to be healthy and vigorous in order to have that bloom which is so desirable. Pigs that are unhealthy rarely show evidences of vigour, and they invariably lack bloom, the external evidence of a healthy, active circulation of rich red blood.

A report from New Zealand reads that records of experiments there indicate that 3 gallons of skim milk plus 1 lb. of concentrates made up of meat meal (62 per cent. protein) and pollard produces 1 lb. of pork in healthy, well-grown pigs; with rations of that make-up a 60-80 lb. porker is possible in sixteen weeks at a cost of approximately 5s. for each pig for concentrates used. Pigs produced on dairy farms along these lines should show a much greater margin of profit than those animals fed entirely upon skim milk in the absence of concentrates.

Statistical data for New Zealand indicates that under the ordinary methods of feeding where no attention is given to the inclusion of protein rich concentrates in the ration, it takes 10 gallons of skim milk to produce 1 lb. of pork. The question that arises is what is skim milk worth under these conditions as compared with the efficient use of concentrates with the milk?

Pedigree, plus performance, backed up by efficient feeding and management, should be the ideal of the pig-farmer. There is still a profit in pigs if they are handled correctly.

# Answers to Correspondents.

## BOTANY.

### Nut Grass.

F.H.S. (Proserpine)—

It is rather difficult to tell some of the sedges allied to nut grass in the absence of seed heads. However, I think there is no doubt that the specimen you send represents the common Nut Grass (*Cyperus rotundus*), that is such a pest of cultivation in Queensland. Regarding eradication, on the whole poisonous sprays have proved of little or no value unless several applications are made. Experience has shown, however, that small patches can be eradicated by the application of cheap grade salt at the rate of one-quarter pound per square foot, either dry or in the form of brine. Waste brine, as obtainable from butchers, hide stores, &c., is quite suitable. Personally, we have found that the best method of eradication in small patches is to keep the green growth constantly cut off. This, we think, is better than forking the land over. The nut grass tuber is a storehouse of nutriment for the young shoots. The food material stored in the tuber is used in the formation of the young shoot. Cut this off regularly and the tuber will eventually become exhausted. Another point is that the formation of fresh tubers is dependent upon the leaves, and if these are not allowed to grow fresh tubers cannot be formed and the old ones must die of exhaustion. We have seen in the Queensland Press at odd times a recommendation to the effect that small patches should be covered with galvanised iron or some such material, but this is of no value whatever as the nut grass tubers simply remain dormant and spring into active life as soon as the covering is removed. Pigs and poultry, including ducks, of course, do good work in keeping the weed in check in small areas, and on confined places will, in a few years, completely eradicate it. You will find Mr. Summerville's note on Two Insect Enemies of Nut Grass in this issue of the Journal of particular interest.

### Milk Weed—Caustic Creeper.

C.F.H. (Alpha)—

The specimen is not the common Caustic Creeper, but the Milk Weed (*Pratia erecta*), very common in parts of the Darling Downs and Western Queensland. It belongs to a poisonous family of plants and is generally regarded as definitely poisonous to stock though no feeding tests have been carried out with it. The Caustic Weed or Caustic Creeper (*Eophorbia Drummondii*) is somewhat similar in appearance but has much smaller leaves. "The Weeds and Suspected Poisonous Plants of Queensland," by the late F. M. Bailey, is obtainable from this office, price 5s. 3d. postage paid.

### Burr Trefoil.

R. McM. (Woolooga)—

The specimen is the Burr Trefoil (*Medicago denticulata*), a native of Europe, but now naturalised in most warm temperature countries. It is very common in some parts of Queensland in the winter and early spring months, dying off on the approach of summer. It is a valuable fodder for dairy cattle, but if eaten in any quantity is inclined to cause "bloat." On the whole, we think cattle prefer the plant when it is cut and wilted or when it is dying off. Before the plant dies it bears great quantities of seed in the form of small, rather flat, twisted burrs. These, however, are quite nutritious and readily eaten by stock. Seed is not stocked by nurserymen, but once it gets on a place it generally spreads naturally by stock carrying it about or voiding the seeds.

### Cattle Bush—A Common Weed.

A. M. McM. (Springsure)—

1. *Pittosporum phillyræoides*, Cattle Bush. We were very glad to have your notes on this plant. It is a small tree very widely spread in Australia, being found in all the States except Tasmania. It has been called at times Poison Berry Tree, probably owing to the bitter taste of the seeds; but Mr. Tepper, a well known botanist and naturalist in South Australia, and

a very reliable observer, said that the seeds, although bitter to the taste, were used by the aborigines in the interior as food, being pounded into flour. The plant is said to be very freely eaten by both sheep and cattle, though personally we cannot say that we have seen it eaten to any great extent. Your notes on its medicinal properties, however, are quite new to us. We should say it would be quite safe to experiment with.

2. *Chenopodium carinatum*, a very common weed of cultivation in Queensland. In the more inland parts it occurs in sandy soil, and very frequently in great abundance in dried-up watercourses, on creek banks, &c. It contains two poisonous principles, a prussic acid yielding glucoside and an alkaloid, but in spite of this we cannot say that we have ever heard of its causing any losses to stock in Queensland. We have not heard a common name for it.

### Marsh Mallow—Poison Peach.

G.D.D. (Charters Towers)—

The first plant is *Malva pariflora*, the Small-flowered Mallow, more commonly known in Australia as the Marsh Mallow. It is a European plant now widely spread as a naturalised weed in most warm temperate countries. It has been proved by feeding tests to cause "staggers" or "shivers" in stock, particularly travelling stock or working horses, in New South Wales; but no trouble, so far as we know, has been experienced in Queensland, probably, on the whole, because the plant does not occur in such great abundance. Unless forming the bulk of the forage we do not think any trouble is to be feared from it. The other plant is *Trema aspera*, the Peach Leaf Poison Bush or Poison Peach, a native shrub or small tree very common in Queensland and New South Wales. It is generally regarded as a bad poisonous plant. The leaves at times develop a prussic acid-yielding glucoside, when, if eaten in quantity, no doubt trouble will ensue. Most losses have occurred with travelling stock. We have repeatedly seen ordinary paddock stock feed very heavily on the plant without any ill effects whatever.

### Wax Vine, a Poisonous Plant.

B.B. (Wondai)—

The specimen is *Hoya australis*, sometimes known as the Wax Flower or Wax Vine. It is known to be a poisonous plant, and is, as you assume, the probable cause of your trouble.

### Giant "Fat Hen," Wild Cotton.

C.V.J. (Cooyar)—

The Giant Fat Hen is *Chenopodium album*. It is a common European weed now widely spread through most of the temperate regions of the world. It is not known to possess any poisonous or harmful properties.

The other plant, Wild Cotton, is *Gomphocarpus fruticosus*. It belongs to a dangerous family of plants, the *Asclepiadaceæ*, and Dr. Seddon, of the Veterinary Research Institute, Glenfield, New South Wales, advised us in conversation recently that feeding tests carried out with it had proved it definitely poisonous to stock.

### Love-in-the-Mist Passion Vine.

J. H. McC. (Hughenden)—

The specimen forwarded with your letter of 29th May and labelled No. 57 is *Passiflora foetida*, sometimes known as Love-in-the-Mist Passion Vine. It is much cultivated in tropical countries as a cover crop and green manure in cocoanut plantations, &c. The vine is quite common in North Queensland and coastal localities, and the ripe fruits are often eaten by children. They have a pleasant flavour, but, as they contain a prussic-acid-yielding glucoside, some danger always attaches to them, though we must say no trouble has been brought under our notice.

### Russian Thistle.

Inquirer (Gladstone)—

The specimen represents *Salsola Kali*, a very common plant in Queensland. It occurs both on the coast and inland. It has a wide distribution in one form or other over most of the warm regions of the world, and is commonly

referred to as Russian Thistle. The plant is not known to possess any poisonous properties, though its fodder value is very limited. In its very young stage it is sometimes eaten by stock, and in its older stages the seed-heads are much relished by horses and stock in general, and are nutritious.

The plant is in no way related to the Townsville Lucerne, and it is hard to imagine it having been an impurity in the seed, because it is a tall plant, whereas the Townsville Lucerne is a low or creeping one, the seeds are in no way similar, and it is hard to imagine how the contamination could occur.

### Western Rosewood.

R.P.H. (Roma)—

The specimen is *Heterodendron oleæfolium,* commonly known as Western Rosewood. Generally speaking, this tree makes excellent fodder for stock, but there is always some danger in using it, as it develops, like young Sorghum and some other plants, a prussic-acid-yielding glucoside, when, if eaten in quantity on an empty stomach by hungry sheep, death will ensue. We had advice from Mount Abundance recently that a grazier had been feeding his sheep with different trees, including Red Heart or Boonaree, and had had a very serious smash. We had never heard the name "Red Heart" applied to the Heterodendron before, but from the symptoms described—that is, the sheep dying very rapidly after drinking—we strongly suspected this plant.

Stock are very fond of the tree, and if you are hand-feeding we think you will find it quite safe to feed after the leaves have wilted for a short time. Several losses have been recorded in New South Wales, but loss at Mount Abundance is the first definite one that has come under our notice in Queensland, though the plant, we know, has been, and still is, largely cut for fodder.

### Valuable Native Herbage.

J.H.McC. (Hughenden)—

The specimen labelled "Horse Weed from Eldorado Station" represents *Psoralea cinerea.* There are a number of species of the genus Psoralea in Queensland and the Northern Territory, and we look upon them as among the most valuable of native herbage. They are legumes, nutritious, and palatable to stock, and are very important members of the native mixed pasture. We think *Psoralea cinerea* and its allies are well worth conserving on any run where they happen to be growing.

### "Stagger Weed."

D.K. (Kandanga)—

The weed is *Lamium amplexicaule,* a species of Stagger Weed, sometimes known as Henbit. Feeding experiments with this plant in New South Wales have definitely proved that it can cause "staggers" or "shivers" in working stock or sheep or cattle that are being driven, death ensuing if the affected stock are not taken off the Lamium-infested country. Ordinary resting-paddock stock, such as calves, dairy cows, &c., do not seem to become affected. The excitement of being driven or worked is necessary, apparently, to bring on the symptoms.

### Burr Trefoil.

E.C.D. (Townsville)—

The specimen is *Medicago denticulata,* the Burr Trefoil, a native of Southern Europe, now naturalised in most warm temperate countries. It is much more abundant in Southern Queensland and New South Wales than in the North. It is undoubtedly a valuable fodder, providing a large amount of food during the late winter and spring months, dying off at the approach of hot weather. When very green and succulent it is inclined to bloat stock badly. When dying off it leaves a lot of little burr-like pods, which, however, are readily eaten by stock, and, containing seed as they do, are quite nutritious.

**Milk-tainting Weeds.**

W.R.S. (Rockhampton)—

The taller-growing specimen, *Lepidium ruderale*, is Wild Cress. The more succulent and creeping plant is *Senebiera didyma*, Wart Cress or Bitter Cress. These plants must be looked upon as two of the worst, if not the worst, milk-tainting weeds we have in Queensland. We have had no experience with them tainting the flesh of stock which may feed on them, but should think it likely.

**"Brigalow Grass."**

E.F.McL. (Torrens Creek, N.Q.)—

The specimens have been determined as follows:—

*Eriochloa* sp. *Paspalidium cæspitosum.* We were very interested in getting this grass, as we had not had it from your locality before. It is generally known as Brigalow Grass, but some people call it Wallaby Grass. It has recently come into prominence as a fodder, stockowners affirming that it responds well to both winter and summer rains, and that it is palatable and nutritious. Our experience has been that it is more or less confined to brigalow country, but so far as we know no Brigalow occurs anywhere near Torrens Creek.

*Amphilophis intermedia*, a species of Blue Grass, a tall-growing, coarse grass, nevertheless providing a large amount of valuable forage for cattle.

**English Meadow Grass.**

F.J.M. (Woodford)—

No. 1 is *Poa annua*, English Meadow Grass, a common European grass now widely spread over most warm temperate countries. In Southern Queensland it often occurs in great abundance during the winter months, dying off on the approach of hot weather. While it lasts it is a very good fodder for stock. Generally speaking, it prefers old cultivation lands around cowyards, &c., or anywhere where the ground has been disturbed. Some farmers, however, have told us that it invades the ordinary pasture, providing a valuable fodder during the late winter and early spring months. No. 2 seems to be the same as No. 1, but seed heads would be necesasry to make certain.

**Hexham Scent.**

A.C.A. (Cooran)—

The specimen is *Melilotus parviflora*, the Melilot or Hexham Scent. This plant was boomed as a fodder some years ago under the name of King Island Melilot. For sandy soils, and places generally where lucerne and better clovers will not thrive, it has some value, especially for fattening stock. A drawback to it from a dairy point of view is that it taints milk and cream badly. We were interested in your remarks that cattle eat it quite readily, for generally our experience in Queensland has been that stock do not take to it. We do not think the plant is worth while letting go to seed.

**Parramatta Grass.**

E.W.L. (Landsborough)—

The specimen is *Sporobolus Berteroanus*, most commonly known in Australia as Parramatta Grass. It is a weedy grass of very low value as a fodder. It is a very aggressive grass, however, and in heavily stocked paddocks is inclined to crowd out paspalum, especially on the drier and poorer soils. On this account it should be eradicated where possible.

**Prickly Poppy.**

Inquirer (Tambo)—

The specimen is *Argemone mexicana*, the Prickly Poppy, a noxious weed, a native of tropical America, now naturalised in most tropical and subtropical countries. It is very common in some parts of Queensland, and is generally regarded as poisonous to stock. It is rarely eaten by them, however, the only cases of trouble that have come under our notice having been where the plants were cut, allowed to wilt, and became soft.

**Johnson Grass.**

R.H.M. (Kingaroy)—

It is rather difficult to name grasses from roots only, but we think there is no doubt that those you forwarded represent Johnson Grass, *Sorghum halpense.*

This grass provides a certain amount of roughage for stock, but, like other sorghums, contains, especially in its young growth, a prussic acid-yielding glucoside. We have at least one record of pigs being poisoned from eating the white underground runners. The grass is a great pest in a cultivation, and on this account should be eradicated. If the patch is only a small one, careful forking out and stacking, and subsequent burning, would be the best method. Care should be taken not to carry the roots about the field more than possible, for even the smallest piece, if broken off, provided there is an eye to it, will grow.

**"Brigalow Grass;" Eriochloa; Gall Weed; Lucas's Rhodes Grass.**

C.J.L. (Theodore)—The specimens have been determined as follows:—

1. *Paspalidium distans.*—This is different from Dr. Hirschfeld's grass, which has now been called *Paspalidium cæspitosum.* Both species, apparently, are widely spread in Queensland, though *P. distans* is probably the much commoner of the two. We have had several samples sent to us, and, generally speaking, it is spoken well of as a fodder. Mr. Garvey, of Fernlees, Central Queensland, sent us specimens the other day, saying that this particular species of Brigalow Grass responded magnificently where the brigalow was ringbarked, and provided a wonderful supply of edible fodder. He stated that it was drought-resistant, but required to be grazed short for sheep.

2. *Eriochlœ sp.*—The genus *Eriochlœ* is at present under review, but we have several species in Queensland, and they are generally regarded as palatable and nutritious grasses. We doubt, however, if they are very drought-resistant.

3. *Zygophyllum apiculatum,* the Gall Weed or Twin Leaf.—It has been suspected of poisoning stock, but is practically always avoided by them. An allied species in Central Australia is said to be used in times of drought, however.

In reply to your request regarding Lucas's Curse or Lucas's Rhodes Grass, we are not sure what you mean, but probably you refer to *Chloris virgata,* an annual grass very similar to Rhodes Grass, but with a much heavier and darker seed-head. It is sometimes called Feather Top. It is a luscious-looking grass, but apparently unpalatable and never eaten by stock, unless they are absolutely forced on to it. It is not a pest of cultivation, and should easily enough be got rid of. Perhaps you could let us have a seed-head to make sure of the identification.

**Hoya or Wax Flower.**

Inquirer (Brisbane)—

*Hoya australis,* Hoya or Wax Flower, is a climbing plant. The leaves are of a rather succulent nature, smooth, and somewhat shiny. Both leaves and stems, when cut, exude a milky sap. The flowers are white, rather waxy in appearance, and sweetly scented. The plant is poisonous, causing severe gastro-enteritis in stock. In the "Queensland Agricultural Journal" for December, 1915, Mr. A. McGowan, then one of the Government veterinary surgeons, recommended the following remedy:—"1 lb. of Epsom salts and 1 lb. of treacle to be given as soon as the animal is noticed to be sick. This should be followed daily with 2 dr. potassium iodide dissolved in ½ pint of water."

**Saccaline for Winter Feed.**

J.F.D. (Camp Mountain)—

The Director of Agriculture advises:—Saccaline to be used for winter feed should be sown in January, when it will stand over the early part of the winter, and can be cut when desired. It is advisable to take the precaution of allowing the plant to seed prior to feeding it to valuable stock.

Saccharine or sweet varieties of sorghum invariably grow to a height of from 10 to 15 feet, giving a yield of from 15 to 28 tons per acre, according to the quality of the soil and conditions of climate. The millets and panicums occasionally attain a height of 5 feet, the grain yield being approximately as follows:—Japanese Millet, 8 to 9 tons; Common Panicum or Liberty Millet, 10 tons; and White Panicum, 12 tons per acre.

**Sticky Oilskin Coat.**

Inquirer (Toowoomba)—

We have had no personal experience of these methods of treating a sticky oilskin coat, but they are said to be reliable:—

(1) If the oilskin is sticky, it would be necessary to boil it in a solution of washing soda and water. After it has dried it should be redressed with oil-dressing.

(2) The application of French chalk in liberal quantities to the sticky portions of the coat is another method that could be employed to remove the stickiness. The chalk must be allowed to remain on the coat for twenty-four hours, when it may be brushed off. Of course, there will be a white mark that will remain for some time, but this method is shorter and more convenient than the boiling method.

A Departmental leaflet on home-made oilskins and tarpaulins has been posted to you direct.

# General Notes.

**Staff Changes and Appointments.**

Messrs. J. C. J. Maunder, B.V.Sc. (chairman), Government Veterinary Surgeon, D. Jackson (Teneriffe), and M. F. Yore (Logan Village), have been appointed members of the Darling Downs South District Stallion Board.

Mr. W. D. Wilson, Ranger under the Animals and Birds Acts, has been appointed Senior Ranger, Animals and Birds Acts, Department of Agriculture and Stock.

Messrs. W. J. Muller, W. R. Perkins (Mooloolah), J. B. Higgins, E. W. Baker (Diamond Valley, Mooloolah), F. C. Henderson (Eudlo), F. J. Dicksen (Petches Creek, Tallebudgera), A. E. Treloar (Myrtletown), R. B. Prior (Meeandah), and E. W. Gager (Eagle Farm) have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. T. H. Cameron, Barboda, Anakie, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. A. Pitts, Overseer of the Shire Council, Mirani, has been appointed an Honorary Ranger under the Native Plants Protection Act.

Constables S. H. Patch (Tara), M. Y. O'Shaughnessy (Eromanga), J. E. T. Pratt (Forsayth), and B. Topp (St. Lawrence) have been appointed also Inspectors under the Slaughtering Act.

Mr. B. Dunbavand, Inspector of Slaughter-houses, Ingham, has been appointed also an Inspector under the Brands Acts.

Members of Stallion Boards have been appointed as hereunder:—

*West Moreton District Stallion Board*—J. C. J. Maunder, B.V.Sc. (chairman), R. G. Talbot (Ripplebrook, St. Lawrence), W. J. Tomkins (Whetstone, Inglewood); *Darling Downs North District Stallion Board*—A. F. S. Ohman, M.V.Sc. (chairman), A. F. Muller (Fassifern Valley, Kalbar), N. Hastings (Maryborough).

Mr. J. McG. Wills, Agent, Banana Industry Protection Act, Southport, has been appointed also an Inspector under the Diseases in Plants Acts.

Mr. H. W. Eastwood, Senior Fruit Instructor in the New South Wales Department of Agriculture, who is stationed at Murwillumbah, has been appointed also an Honorary Inspector under the Queensland Diseases in Plants Acts.

Mr. H. T. Whitcher has been appointed Cane Tester at the Qunaba Sugar Mill for the present crushing season.

Mr. A. G. Smyrell, Inspector of Stock at Bowen, has been appointed also an Inspector of Dairies.

Constable E. Hanlon, Westwood, has been appointed also an Inspector of Slaughterhouses.

Mr. E. E. Grimson, of Gayndah, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Messrs. J. Cole, G. H. Coombs, E. Abrahams, T. Spowart, G. Parker, O. Schneid (Mudgeeraba District), and W. Brooks, G. Herbst, and H. Groom (Woodford District), have been appointed Honorary Inspectors under the Diseases in Plants Acts for the purpose of the control of banana diseases in their districts.

## Newspaper Postage Deficiency.

The Postmaster-General's Department advises that daily and weekly registered newspapers are sometimes under 6 oz. in weight, and at other times over 6 oz., and, as the rate of postage when posted by the public to addresses within Australia is 1d. per 6 oz. or fraction thereof, the result is that many thousands are posted annually bearing only 1d. postage when they should bear 2d. These are surcharged double the deficiency, which is collected from the addressee. The senders are, perhaps, not particularly to blame for this, because they may inquire at the post office the amount of postage required on a certain paper, and, as that particular issue happens to be under 6 oz., they are informed 1d. is necessary, and from this they erroneously conclude that all copies of that particular paper will pass for 1d. and deem any further inquiry as to postage unnecessary.

Approximately 2,000 underpaid newspapers are surcharged monthly at the G.P.O., Brisbane. In some instances the newspapers that vary in weight contain an announcement to the effect that an issue of pages requires 1d. postage, but issues of a greater number of pages require 2d. This, however, appears to fail to meet the situation fully.

In connection with the larger illustrated papers—particularly weekly and monthly publications—large numbers addressed to places beyond the Commonwealth are posted insufficiently stamped, and these are merely destroyed in the Dead Letter Office, as surcharged newspapers are not sent abroad. This results in economic waste, as the senders first purchase the papers with the intention of sending them to friends abroad, and, by not affixing sufficient postage, lose not only the purchase price, but also the value of the stamps actually affixed, the net result being that not only do the senders waste money, but the newspaper concerned possibly loses a new subscriber.

The Postal Department aims to have all postal articles correctly prepaid and so avoid not only economic waste but also hard feelings naturally engendered in the addressees by their being required to pay double the deficient postage. Some newspapers make it a practice to print the postage required to various destinations on each issue in the paper itself or on the wrapper, but even that apparently fails to achieve the desired object.

## Peanut Board Election.

An election of a member for District No. 1 of the Peanut Board resulted as follows:—

| | Votes. |
|---|---|
| Charles Frederick Adermann (Kingaroy) .. .. | 91 |
| Godfried Martinius Pedersen (Wooroolin) .. .. | 89 |

Mr. Adermann and Mr. N. A. Nielsen, of Milman, who was returned unopposed for District No. 2, will be appointed for a term of two years as from 28th August.

## Atherton Tableland Maize Board.

Regulations have been approved under the Primary Producers' Organisation and Marketing Acts empowering the Atherton Tableland Maize Board to make a levy on all growers of maize in the Petty Sessions Districts of Atherton, Herberton, and Chillagoe at the rate of £1 5s. per ton weight of maize that shall have been harvested during the period commencing 1st June, 1933, and ending 31st December, 1933, to provide for the administrative expenses of the Board and for the current yearly instalment of interest and redemption due and payable to the Crown.

The Queensland Commissioner for Railways and the Commissioner for Main Roads are empowered to collect the levy, and such shall be forwarded monthly to the secretary of the Atherton Tableland Maize Board with a statement showing the sources from which same was collected. Any balance over and above the amount required for the purpose indicated shall be distributed among the growers from whom such levy was collected, at the end of the current season, in proportion to the amounts collected from them.

### State Wheat Board Election.

Following is the result of four growers' representatives on the Wheat Board:—

| | Votes. |
|---|---|
| Ernest Ambrose Thomas (Hunterton, via Roma) .. .. | 1,470 |
| Joseph James Booth (Junabee) .. .. .. .. | 1,448 |
| Thos. Wm. McIntyre (Yarranlea, Pittsworth) .. .. | 1,366 |
| Wilfred John Brimblecombe (Pirrinuan, via Dalby) .. | 1,349 |
| Arthur Carl Krieg (Brookstead) .. .. .. .. | 1,048 |
| Bergittinus Clemen Christian Kirkegaard (Freestone) .. | 973 |
| John Edward Nussey (Allora) .. .. .. .. .. | 937 |
| Aaron Hoskin (Mount View, Jimbour) .. .. .. | 797 |
| Edward Fitzgerald (Felton) .. .. .. .. .. | 354 |
| Wm. Edward McColm (Toolburra) .. .. .. .. | 270 |

The retiring members were Messrs. E. A. Thomas (chairman), T. W. McIntyre, B. C. C. Kirkegaard, J. E. Nussey, and W. J. Brimblecombe. The new Board will be appointed for a term of one year. The representatives for this year have been elected by the growers from the whole of the wheatgrowing areas, and not from districts as formerly. The number of ballot-papers issued was 3,482, and of that number 2,568 (73.75 per cent.) were returned.

### Cheese Board.

An Order in Council has been approved extending the operations of the Cheese Board for the period from 1st August, 1933, to 31st July, 1934.

### Banana Board Levy.

An Order in Council has been issued under "*The Banana Industry Protection Act of* 1929" providing for a levy on banana-growers, to be used for the maintenance of the Banana Industry Protection Board. This levy is the same as that imposed last year. The Order provides that, with respect to bananas marketed in the State, the levy shall be collected by means of a deduction to be made by all commission agents, merchants, or persons from proceeds of sales of bananas, the amount to be remitted to the Under Secretary, Department of Agriculture and Stock, not later than the 7th of the following month; also, in regard to bananas marketed outside Queensland, the method of collection shall be by means of the Committee of Direction or the Railway Commissioner adding the sum of 2s. 10d. per ton to the freight charges on bananas, and remitting same to the Under Secretary not later than the 7th of the following month. In the case of bananas (marketed in Queensland or elsewhere) which are not marketed or sent to market by commission agents, merchants, or others, or by or through the Committee of Direction or the Railway Commissioner, the levy shall be remitted by the grower to the Under Secretary not later than the 7th of the following month. This levy remains operative as from 1st August, 1933.

### Tobacco-Growers as Primary Producers.

Executive approval has been given to the issue of an Order in Council under "*The Primary Producers' Co-operative Associations Acts,* 1923 *to* 1926," declaring that a person, not being a person engaged in primary production as an employee on wages or piecework rates, engaged in the occupation of tobacco-grower shall be a primary producer for the purposes of the abovementioned Acts. The existing definition of a "primary producer" does not include a "tobacco-grower."

### Banana Levy—Southern.

Regulations have been issued under the Fruit Marketing Organisation Acts providing that the existing Banana Levy Regulations shall be repealed insofar as relates to the district between Nerang and the Tweed, and imposing a levy on the growers of bananas in such district.

The new Regulations apply to those growers in the south-eastern portion of the State who are situated in the area bounded on the north by a line as the crow flies from Beaudesert to Nerang, thence by the coast to the New South Wales border, thence by the New South Wales border to where intercepted by the Brisbane-Kyogle railway line, and thence by that railway line to a point nearest to Beaudesert.

The levy is one halfpenny per case containing $1\frac{1}{2}$ bushels or less of bananas, and when sold in the bunch one penny for every £2 or part thereof of the net proceeds upon all bananas grown in the above area. Bananas shall be deemed to be marketed as

and when removed off the land on which they have been grown in the area specified above, and levies are to be paid before the fifteenth day of the month by the grower concerned on bananas marketed the preceding calendar month, but on any such bananas consigned to, by, or through the Committee of Direction of Fruit Marketing, the levy payable will be arranged for collection by the Committee of Direction. For fruit marketed otherwise than through the Committee, then the grower shall on or before the fifteenth day each calendar month furnish a return in writing to the Committee of Direction, Brisbane.

Every company, association, firm, or person carrying or receiving for consigning in the specified district as part of the process of marketing bananas grown in such district shall furnish on or before the fifth day of each calendar month a return in writing to the Committee of Direction of such bananas carried or received by them for consigning during the preceding calendar month, and shall at all reasonable times permit any authorised officer of the Committee of Direction to inspect such books or accounts as may be necessary to ascertain if the regulations are being complied with.

All monies raised by the levy shall be expended only in the interests of the banana section of the Queensland fruitgrowing industry, and any grower in the above district who fails to pay the levy shall be guilty of an offence and liable to a penalty of £20.

### Tobacco Export Trade—A Correction.

In General Notes, page 257 of the September Journal, in the course of a statement on the tobacco export trade, the preferential duty on unmanufactured tobacco in the United Kingdom is shown as 7.5½d. per lb., the full duty being 9s. 6d. per lb., in respect to leaf containing 10 per cent. or more of moisture; 8.2⅞d. and 10s. 6d. respectively for leaf with a moisture content of less than 10 per cent. In the next paragraph it was stated that the preference on Empire tobacco of higher moisture content is 2s. 0¼d. per lb.

On reference to the original copy we find that the figures were not set out clearly. The corrected table is as under:—

RATES OF DUTY IN THE UNITED KINGDOM.

*Tobacco Unmanufactured—*

| | Full Duty. Per lb. s. | d. | Preferential Duty. Per lb. s. | d. |
|---|---|---|---|---|
| *If unstripped—* | | | | |
| Containing 10 lb. or more of moisture in every 100 lb. weight .. .. .. | 9 | 6 | 7 | 5½ |
| Containing less than 10 lb. of moisture in every 100 lb. weight .. .. .. | 10 | 6 | 8 | 2⅞ |

### Broom Millet Board Election.

The following nominations have been received at the Department of Agriculture and Stock in connection with the election of two growers' representatives on the Broom Millet Board:—Ernest Fred Hutley (Gurgeena, via Gayndah), Hans Niemeyer (Hatton Vale, Laidley), Thomas Martin Rasmussen (The Caves), and Erich Max Schneider (Binjour Plateau, Gayndah). The date of the election has been fixed for the 20th October.

# Rural Topics.

### Mixed Farming.

*Following is a summary of a paper read at a branch conference of the Agricultural Bureau of South Australia by Mr. Frank Masters, an Eyre Peninsula farmer:—*

This is recognised as the day of the specialist—the man with one aim, devoting his whole time, energy, and costs to achieve the best and highest that points the way and goes furthest. But all cannot be specialists, either from inclination or ability, or the financial position of one may preclude the necessary expense.

I regard mixed farming as an insurance for successful operation. A lifelong experience in the farming vocation has shown me that never until the present have all prices of produce been down to the lowest together, but usually either wheat,

wool, butter, eggs, pigs, or lambs have been higher in value than the depressed commodity, and has enabled the mixed farmer to pull through, whereas with wheat alone, and many of the other singly, disaster would have been inevitable.

By mixed farming practice the waste of the farm in offal, weeds, &c., can be controlled, eliminated, and turned into profit. Cases in point are the farm flock grazing partially at least on weeds encouraged by cultivation, the dairy herd grazing similarly and supplemented by storage of ensilage from the abundant winter growth, and pigs partially grazing weeds, supplemented by offal otherwise unsaleable.

Without these waste savers, the majority of farms would be unprofitable, even with good prices. No waste can be permitted to-day, and only the mixed farmer can make the best of this opportunity of converting the waste into saleable produce.

With fluctuating values for various products, mixed farming alone offers the agriculturist the opportunity of conversion into more payable products—those products which may be unremunerative when sold directly.

In this case wheat, oats, barley, and hay at low prices may be fed to animals and poultry on the farm and better returns secured. Too often we forget we have an advantage in doing this on the farm, instead of allowing the feeding specialist to do so, in the fact that expense of bags, partial cost of freight, &c., contributes towards the profitable conversion, together with the feeding specialist's profit.

Mixed farming widens the horizon of interests, and one can find in it that variety which becomes the spice of life. Change from the humdrum of one thing brings recreation and relaxation that means invigoration of body, mind, and spirit. The watching, helping, and encouraging of the natural laws of breeding, feeding to secure higher and better growth and production, becomes an absorption once one tastes the fruits of success therein. Always ahead and before the enticing possibility of growing better wheat, better wool, better sheep, better lambs, better pigs, and poultry is the triumph which makes effort worth while.

*Factors Essential in Mixed Farming.*—These are judgment, management, feeding, and marketing. Judgment really is included in the whole four and makes or mars the whole. It may be termed initial and incidental, and initially is concerned with securing the start or successful inauguration of mixed farming. Finance is usually the governing factor. Judgment demands purchasing the best, but the settler on new country is limited to the funds at his disposal. Aim not at quantity, but quality.

Pedigrees of stock are fully protected by herd societies and stock associations, and proper Governmental authenticated tests can be relied upon by the producer, so that in them he has an excellent guide for selecting initial and subsequent stock, and if he cannot for any reason purchase the best at the outset, he can, through the above records, be sure of buying later stock that will improve those he possesses, according to his judgment and pocket.

The process of improvement of quality will be slower, and for most will be the one followed. Management, however, must be on sound lines.

In wheat, starting with good varieties suited to the district, continual care is necessary regarding cultivation, manuring, harvesting, &c., so that the best sample is produced. Bad management means deterioration of returns and price. The admixture of foreign grains, notably barley, must eventually reduce its value.

Whilst the crossbred animal appears to be the ideal for meat purposes, yet the nondescript crossbreeding resulting in mongrels without type or character must be avoided. The fat jowelled pig must disappear from farms, being displaced by the longer, leaner, and small headed pig, with the Large White predominating in crossing, but the Tamworth-Mid York mother seems the ideal, with the Large White sire. Produce what our customers require and get away from anything of our own fancy. This is true of all production, but notably true regarding the pig.

More judgment is required in managing cows. The weighing and testing of milk is the only certain way of finding out the boarder. Here again the registration of bulls gives an excellent avenue to secure increased quality in the herd. Combination in a locality of a number of farmers would make it easy to secure excellent blood of cattle and horses in the purchase from time to time of good sires. It has been said that half the breed is in the feed, and here a few suggestions are offered. Understock rather than overstock, but adequate stocking is necessary. Research has shown short grass to be the best.

All stock must be kept growing, any setback or stunting means loss of quality and increased cost to restore that quality, which indeed is not always possible, therefore reserves of fodder are necessary.

Once a farm is properly fenced, every effort should be made to carry the most stock possible, consistent with proper results, thus making the return for improvement greater.

Regarding the question of marketing, much remains to be done in the way of organisation. The individual selling of production without due consideration of effect on prices appears to be a question which needs mature consideration. The bulking of consignments of given quality of lines of production may give confidence to customers, and for such lines increased prices should result.

The mixed farm should be conducted from the standpoint of realising the highest returns to the owner. So convinced am I of the necessity of mixed farming that I am inclined to propound the axiom "The farm which is not a mixed farm is no farm at all." In the same way a farm without permanent supplies of water cannot be considered a farm, but both are essentials.

**Queensland Butter for "The Kangaroos."**

In his notes on the tour of the Australian Rugby League team of footballers now in England, and published in the Brisbane "Telegraph," Mr. Harry Sunderland remarks:—

> "We are eating Empire butter at 11d. a pound. I inspected the store yesterday and found amongst the stock ordered for us a butter box with the brand on it—'Pasteurised Pure Creamery Butter Arcadia. The Downs Co-operative Dairy Association, Limited, Queensland.' "

The Downs is noted for good footballers as well as for good butter, and no doubt much of the vigour and vim and fine physique of Toowoomba's "Galloping Clydesdales" can be traced to the richness of the district pastures and the high vitamin content of its dairy produce.

**Care and Handling of Cream.**

"Most of the troubles in milk and cream are caused by organisms closely associated with something that is unclean," observed Mr. C. J. Robinson, manager of Bimbaya Butter Factory (New South Wales) in an address at the recent South Coast conference of the New South Wales Agricultural Bureau. In the following passages he referred to some of the common causes of contamination and the measures necessary for its control:—

"Milk in the udder of a healthy cow, under normal conditions, is practically free from bacteria, but directly it is drawn from the cow by ordinary methods of milking it is exposed to the attack of destructive agencies in the form of bacteria. Trouble may start with the cows lying down in the yard waiting their turn to be milked. Milk oozing from teats in contact with the ground becomes infected with bacteria which work up the teat canal and rapidly multiply. Through this cause the first milk drawn from the cow frequently contains large number of objectionable organisms, and dairymen are well advised to discard the first few squirts of milk. Practically nothing is lost in doing so, as it has been definitely proved that this first milk contains practically no butter-fat.

"Again, infection is caused by dust on the cow's flanks and udders dropping into the mik while milking. A very effective way to prevent this is to wipe the flanks and udders with a damp cloth. Cow-bails and yards should always be kept clean. Dirty utensils—buckets, strainers, &c.—should be strictly avoided, and in this connection it should be remembered that no dairy utensil is clean unless it has been scalded with boiling water. This will destroy any bacteria which might remain. Everyone believes in straining the milk, yet a dirty strainer, whether cloth or gauze, is worse than no strainer at all. Time lost in occasionally shaking out or rinsing the strainer during milking operations is time well spent. This would prevent a large number of objectionable unclean substances being added to the milk. Clean hands and clothing are almost as important as clean utensils. It is particularly important to wash the hands at intervals during milking operations.

"Separators should be thoroughtly washed and scalded after using, night and morning. The modern separator is very easily cleaned, and to get the best results the parts should be placed in boiling water. The boiling water will destroy all germ life remaining after washing, and when taken out of the water the tinware will dry rapidly without the use of a cloth. From the point of view of public health, as well as in the interests of the industry, the dairyman who does not wash his separator after every separating richly deserves all that the law holds in store for him. Unclean milk cans are also a serious source of infection. No man can be certain of producing choicest quality if he does not wash and scald his cans and allow them to cool before using them, even though he may think they are clean when returned from the factory. If this is not done the cream may develop an unclean flavour, and, of course, must be graded down.

"In cases where petrol tins are used as cream containers at the dairy, the seams in the tin should be soldered, otherwise they are a source of contamination which will surely soon be seen in the cream quality. After being in use for some time unsoldered seams become a 'safe deposit' for a yellowish slime, which is practically a bacterial culture, and which will adversely affect cream quality.

"Cream and separator rooms should be kept clean at all times. The floor should be scrubbed with a broom. If well drained they will dry in a short time, and the room is left sweet and clean. If properly used under clean conditions nothing will give better results than a milk or cream cooler. Besides lowering the temperature of the cream, and thus checking bacterial development, coolers aerate the cream, release gases and food flavours, and improve the body and consistency. If coolers were generally used there is no doubt that marked improvement in the quality of cream delivered to the butter factory would result. It is advisable always to mix the freshly separated cream (after it is cooled) with the cream already held in the dairy. Lots should not be held separately until delivery day. The mixed cream should be stirred with a metal stirrer at intervals in order to keep the mass uniform.

"Dairymen can rest assured that graders at dairy produce factories know the difference between good and bad quality. If cream is classified out of choice grade it has definitely an 'off' flavour or taint of some description. No manager or grader desires to receive cream of inferior quality at the factory. The cause of the inferiority is to be found somewhere between the cow and the factory, and can usually be overcome by cleanliness and attention to detail, not by assuming that all conditions under which the cream is produced are ideal and that the factory manager or grader is wrong."

## Prevention of Disease in Stock.

In the prevention of disease or the spread of disease in stock much may be accomplished by management in accordance with the knowledge which science has disclosed. Emphasising this fact in the course of a recent address to farmers, the District Veterinary Officer (South) of the New South Wales Department of Agriculture specified some ways in which losses might be avoided or appreciably reduced.

*Precautions During Shearing.*—We know, for example, it was pointed out, of a number of serious diseases which may occur if shearing operations are not carried out with due regard to proper sanitary precautions. Old skins are strewn over the board between shearings, and these may leave germs which find refuge in cracks in the boards, which are packed with the accumulated dirt of years, while the counting out pens are inches deep in manure, dead wool, and portions of horns and hooves. The open and bleeding wounds of sheep mutilated at shearing are brought in contact with this germ-laden filth, and if harmful germs happen to be represented in the debris, then a percentage of sheep will be lost from tetanus or gas gangrene (blood-poisoning), to say nothing of the very high percentage of sheep which will contract "cheesy gland" (caseous lymphadenitis) in this way. Dirty knives and yards may cause a like loss in lambs, subsequent to marking. All of these losses may be prevented absolutely by careful attention to cleanliness round the shearing shed and marking yards.

*Control of Liver Fluke.*—The liver fluke of sheep and cattle is a parasite which can only continue to propagate by passing part of its life in the sheep's liver and part in the fresh water snail. If the snails be killed out by treating the water-courses with bluestone then the fluke must die out. Black disease of sheep depends upon the liver fluke, so that the treatment just referred to is a method of dealing with these two serious conditions at the same time.

The hydatid that is so commonly seen in the livers and lungs of sheep and cattle is the same one that affects the human being. Like the liver fluke, it must also pass through another animal to complete its life cycle, but in the case of the hydatid, the dog is the other animal necessary, and yet it appears to be a little known fact that the occurrence of hydatids in the human being, and in sheep and cattle, can be absolutely prevented by the simple procedure of refraining from throwing the raw offal from sheep and cattle to the circle of dogs usually seen waiting for it.

*Losses from Fowl Tick.*—A good example of disease prevention is the method of controlling "tick fever" of poultry. This disease is caused by a blood parasite which is transmitted to the birds by the bite of the fowl tick. The tick is concealed in cracks, &c., in the timber or the bark of trees, especially pepper trees, and comes out at night to feed on the birds on their perches, and in this way a few ticks can kill half the fowls in the yard. All this loss can be prevented definitely

by adopting the recognised methods of having the fowl perches, &c., tick-proof. The control and eradication of the cattle tick and also "redwater," the disease which it transmits, can be effected by dipping the cattle in accordance with the life-history of the parasite. The dipping of sheep for the "tick" or ked and for lice is a practice which demands attention throughout the State in order to prevent the spread of these parasites, and thus save the wool from unnecessary deterioration and the sheep from loss of condition.

*Danger from Poisonous Plants.*—The subject of harmful and poisonous plants is in itself a very large one, and the stockowner or drover can hardly afford to be without some knowledge of plants which are poisonous or which assume poisonous properties under certain sets of conditions. Thus from time to time we hear of heavy losses in sheep or cattle as a result of eating such plants as the variegated or cabbage thistle, blue couch grass, the milk weed (*Euphorbia drummondii*), sorghum and sudan grass types, and the loppings of sugar gum trees. All of the foregoing plants may be poisonous under certain seasonal conditions, and provided the stock which eat them are unaccustomed to them and consume a considerable quantity when hungry. These are but a few of a large list of plants which may be the cause of mortality from time to time.

The destruction of carcases in the paddocks is an item of importance in disease control. The most desirable method is by burning, but when fire risks prevents this, burial might be adopted, and if the ground is too hard for this a lot of good will be done if the carcase is freely opened, the limbs detached, and the internal organs cut and spread about. The heat of the sun will then dry up the flesh and animals and birds will soon dispose of the offal. This method is hardly desirable in the case of germ diseases, but it is an effective way of depriving blowflies of breeding grounds. An outstanding exception to this latter method of disposal is the animal suspected of dying of anthrax. On no account should such a carcase be opened.

*Risks of Indiscriminate Purchasing.*—Many diseases are capable of being introduced into the dairy herd as a result of continual and indiscriminate purchasing. Cattle may carry the microbes of serious diseases in their bodies without betraying the fact in any way. Among such diseases are tuberculosis, pleuro-pneumonia ("pleura"), contagious abortion, and mammitis, and the risk of introducing these diseases is greatly increased to the farmer who continues to buy and sell rather than build up his own herd by breeding. In the same way sheep owners may purchase animals which are lightly infested with lice or tick, and which in the course of a very few months become heavily infested.

## Farm Leaders of To-morrow.

Thus the current "Producers' Review" (Toowoomba):—"Where are we to get new leaders of agriculture? Most, if not all, of our agricultural leaders of to-day have served for a generation or longer; many of them have reached the allotted span of life; many have become mentally dull and physically tired. Yet there are no leaders—no younger men—to take their place."

Thus writes a correspondent in a pertinent reference to farm leadership. There is much truth in his statements, more especially in reference to leadership of some sections of agriculture in Queensland. In the sugar industry there are many young men who are developing as leaders, but even in that section of agriculture there is a need for younger men generally to play their part in taking responsibilities which are becoming more pressing every day.

There are many reasons why the younger men of agriculture should play their part in dealing with the problems which face all sections of primary production.

How can those young men gain the knowledge to fit them to assume leadership? By definitely determining that they will study some section of their industry until they have the knowledge which will fit them to act as leaders. We are all amenable to development. Granted a sound body, with normal sense organs, anyone can develop in any direction he chooses in accordance with his general intelligence and his power to persist in the undertaking which he places before himself as an objective. The men who achieve important positions in life depend less upon their natural special aptitudes or inherited gifts than on acquired ability to fix their attention upon any specific problem. Charles Dickens once said: "The one serviceable, safe, certain, remunerative, attainable quality in every study and pursuit is that of attention. My own knowledge, such as it is, would never have come to me but for the habit of commonplace, humble, patient, daily, toiling, drudging attention."

# The Home and the Garden.

## OUR BABIES.

*Under this heading we issue a monthly series of short articles dealing with the welfare and care of babies, in the hope of increasing their health and happiness, and decreasing the number of unnecessary deaths among them.*

## IN PRAISE OF THE GOAT.

### For the Men and Women of the West.

The sheep makes the squatter wealthy (but often it breaks him). The goat keeps the children of the West healthy. For goat's milk is just as good as cow's milk; indeed, analysis shows very little difference between them. It is a common mistake that goat's milk is stronger than cow's milk. Perhaps during dry spells the cow's milk sold in the Western townships may be rather thin. This occurs also sometimes in Brisbane. If the goat has eaten certain weeds, the milk may have an unpleasant taint. The same happens with the cow. The woman who milks her own goat has three great advantages. She knows that the milk is clean, that it is fresh, and that it contains no added water. It is a foolish mother who says she cannot drink goat's milk. Her children, hearing her, develop the same dislike. This is just a disease of the imagination. We have drunk both cow's and goat's milk, and could not detect any difference between them. From goat's milk you can make the most delicious junket. Mix it with small pieces of fresh oranges, or uncooked ripe tomatoes, and see how your children take it. Kings' sons could have no better food. From goat's milk you can make fresh butter. Though white, it is just as good as yellow butter.

### The Goat Deserves a Statue.

The goat is far more intelligent than the sheep, and much cleaner in habit than the cow. He will forage for himself in seasons when both these would starve and die. Certainly he may be troublesome. Unless they are well fenced, he will rob your gardens. In this he resembles the human boy. What could be more beautiful than the kids? No mother calls her children calves, and few call them lambs, but "kids" is a term of endearment constantly used. To those who know beauty when they see it, the full-grown goat is also a handsome animal. We should like to see his statue on a pedestal in every Western township. He deserves it, for is he not the saviour of your children?

### Do Your Best for the Children.

Why then is he made the butt of so many senseless jokes? You know he cannot live on glass bottles and kerosene tins, though he will bravely tackle anything eatable when food is scarce. Why do you not try to have goat's milk all the year round? A good nanny deprived of her kid, well fed and milked twice a day, will give you milk for nine or twelve months. Because she gives you milk for nothing half the year, you grudge her a little food during the other half. In places like Charleville and Cunnamulla, where gardens can be grown with bore water or river water, surely you can grow some sort of green feed for her! You might even spend a little on lucerne chaff, bran, or maize. In some places, by taking a little trouble, you could feed a few milking goats on mulga during the dry spells. Each place has its own difficulties and problems, and the man on the spot must tackle them. During the long hot spells, when the goats are dry, and the fowls lay no eggs, your children are poorly nourished, and fall easy victims to all infections, including bung-eye and sandy blight, which destroys their eyesight. Do your best for the children.

### A Benevolent Board.

There must be some restrictions on the number of goats. The Charleville District Improvement Board allow ten goats to each family. For each goat there is a registration fee of one shilling, and fivepence for a collar. In necessitous cases the Board remits the fees. At the annual round-up of goats, which does not

take place every year, all unregistered goats are put in the pound. Any necessitous person is allowed to take possession of the goats he needs without charge, before the remainder are destroyed. Gentlemen of the Charleville Board, your regulations are more than just; they are benevolent. On behalf of the children, we thank you.

## WHEN MUTTON IS ON THE DAILY MENU.

*The following paper was read by Mrs. A. F. Cummings at a recent conference of the Upper North Branches of the Agricultural Bureau of South Australia, and published in the "Journal of the Department of Agriculture of South Australia":—*

ON most farms sheep provide the main meat supply, and unless one can vary the cooking the family will get very tired of mutton every day. Some housewives serve the mutton generally as a roast with chops sometimes as a change. Then it is no wonder one hears the remark, "I am sick of mutton." There are quite a variety of ways of cooking this meat which can be made into a tasty meal besides making the most of the meat supply, a consideration in these times. Even when the farmer is his own butcher the sheep means money. The following are some of the ideas I adopt to use up the whole of the sheep, whilst giving the family quite a variety of meat dishes:—

The leg, shoulder, and loin are usually roasted in the oven, or braised in a boiler on the stove. If the mutton is roasted the potatoes are usually baked under the joint. The bone in a leg or shoulder may be removed and the cavity filled with seasoning. This is very nice eaten cold, and makes a nice Sunday dinner, when the "cook" should have a day's rest if possible. The leg or shoulder may be boiled with carrots or parsnips and served with either parsley or onion sauce.

The meat from neck and breast may be put through the mincer, add a little soaked bread, salt, pepper, and thyme, and sausage meat will be provided for breakfast or rolls. For a small family mince one-half for sausage meat, and the rest will make a savoury stew, curry, meat or sea pie. The bones should not be thrown away but boiled to form stock for soup. The breast of mutton may be spread with seasoning, rolled and tied, then boiled or baked; it is best eaten cold. The meat from the neck makes nice Cornish pasties or small meat pies, as it is mostly lean.

The breast of mutton and knuckle end of leg or shoulder with the two kidneys will make a very nice meat pudding or pie. Allow the pudding plenty of time to cook so that the meat will be tender. The knuckle ends of a shoulder and leg and the meat from the head and the tongue will make potted meat, which is very suitable for hot days.

The sheep's head is often thrown away, but properly prepared it makes one or more nourishing meals. The head must be chopped or sawn in two; remove the eyes, tongue, and brains, then soak in salt and water for some hours. The head should be put into cold water and boiled or simmered until the meat will leave the bones. There are several ways of serving:—To make soup—Remove the head, strain, and allow to cool so that any fat may be removed, return to saucepan, add soup vegetables, and thicken with either pearl barley, macaroni, rice, or sago, serve very hot with croutons of toasted bread. The meat from the head may be cut into small pieces (also tongue and brains) and added to the soup which has been thickened with rice or pearl barley. This is sheep's head broth, and the vegetables, carrot, turnip, and onion, may be put on to cook with the head, and the whole simmered for about three hours. Add a little parsley before serving.

Sheep's head fricasseed may be made by cutting the meat, brains, and tongue into small pieces and adding it to white sauce; cook for a few minutes, add parsley, and serve very hot. The tongue may also be salted and boiled, and the brains fried and served on toast. Fricasseed brains make a nourishing meal for an invalid.

The liver and heart should also be used. There are several ways of cooking liver; usually it is fried with rashers of bacon for breakfast. This is a favourite dish. Cut the liver into slices and place in a baking dish or casserole with rashers of bacon, then a thick layer of sliced onions, add pepper, salt, and a good dusting of flour, and nearly cover with water. Place in a hot oven and cook until tender. If a casserole is used, it may be left in the oven for the whole of the afternoon, and the long slow cooking is an improvement.

Another way is to mince the liver, bacon, and onion, put into pie dish, adding a little salt, sage, and pepper. Sprinkle the top with breadcrumbs and dot with butter. Cook in a moderate oven for one hour. This is often called mock goose.

The heart should be stuffed with seasoning and roasted, and the kidneys roasted or cut in halves and fried.

Try some different ways of cooking chops; for instance, haricot chops are a change. For this take neck chops (as these are not so fat), chop in half and fry brown on both sides. Place in a saucepan. Peel and chop one onion, carrot, and turnip (grate the carrot and turnip if liked) and fry until brown. Add pepper and salt and enough flour to thicken, then about 1 pint of water. Stir well and pour over the chops. Allow it to stew for 1½ hours. Curried chops are also nice; these are cooked the same as the former recipe, only using an apple instead of carrot and turnip and adding curry powder with flour, pepper, salt, and sultanas. Serve with boiled rice. Chops are also nice cooked in the oven, and when partly done, pour over them a nice batter.

There are various ways of using up cold mutton left from a previous meal, which are tasty and economical. For this purpose a mincer is a boon to any housekeeper, and should be in every farm home. A very little cold mutton minced with some onion and mixed with breadcrumbs (or soaked stale bread), an egg to bind, will form rissoles for tea or breakfast, or the mince may be heated and served up on toast. The remains of a cold leg of mutton makes nice curry, which will be appreciated in cold weather.

A hash is another method of using up the remains of a leg of mutton. A casserole is nice for this, as the slow cooking in the oven does not make the meat tough. A hash or stew should never be boiled, only simmered.

Potato or shepherd's pie is always a favourite and is easily made from the left-overs of mutton. Mince some cold muton, mix with it some chopped parsley and onion, pepper, salt, and a little flour and stock to moisten. Put into a pie dish and cover with a thick layer of mashed potatoes. Brush over with beaten egg or milk and cook in the oven until it is thoroughly heated a nice brown, garnish with parsley.

This is another way for using cold meat:— 1 cup of minced meat, 1 cup of bread and milk (fairly thin and previously boiled), 1 beaten egg, pepper and salt, 1 teaspoon curry powder and a little chopped onion. Mix together in a pie dish. Sprinkle dry breadcrumbs on top and dot with butter. Bake from 30 to 35 minutes. Rice, breadcrumbs, potatoes, or batter may all be combined with cold mutton, making a very little into a savoury and satisfying meal. The following are some recipes well worth trying:—

*German Patties.*—Cut thin slices of bread, and stamp out with a round cutter. Dip the rounds in melted butter. Make a mince of cold mutton, a tablespoon of grated cheese, a little curry powder, pepper and salt, and some good gravy. Thicken with a little flour. Put as much of the mixture as possible between two rounds of bread, press together, and dip in egg and breadcrumbs. Fry and serve very hot.

*Mince Collops.*—1½ lb. mincemeat, 1 onion, 1 tablespoon of flour, salt, and pepper, 1 pint water, 1 tablespoon fat. Divide the mince into small pieces and make into round balls, rolling in mixed flour, pepper, and salt. Heat the fat in the saucepan and fry the balls until brown all over. When the meat is fried drain most of the fat out of the saucepan, then fry the chopped onion, and add 1 dessert-spoon of flour. Stir until brown, then add water; when boiling add meat balls and simmer one hour.

*Meat Macaroni, and Tomatoes.*—Cold meat, minced or chopped, 3 oz. macaroi, 3 large tomatoes, salt, pepper, sugar, and 1 gill of stock. Boil macaroni for 20 minutes in salted water. Strain and place a layer of it in a greased pie dish. Cover with half the meat, seasoned with pepper and salt, then a layer of sliced tomatoes sprinkled with sugar. Repeat these three layers, cover the top with breadcrumbs, and pour down the side 1 gill of stock. Bake in a moderate oven until the crumbs brown.

In summer it is advisable to put part of the sheep into pickle, as the mutton will not keep fresh in hot weather. Corned mutton is very nice boiled and served hot with carrots or cauliflower and white sauce or as a cold luncheon with lettuce salad.

The caulfat, suet, and any other scraps of fat or dripping should be rendered and put aside for soap or candles. Soap is quite simple to make at home. I generally use 12 lb. of fat at once, boiling it in the copper after the washing is done, but 6 lb. of fat can be made in a kerosene tin.

The skin of the sheep may also be used at home. Tanned or "cured" it will make a very nice mat, and odd pieces can be used to make polishers for floors, furniture, or boots. The wool, washed or "scoured," is used to make wool mattresses or wool-a-downs; it is also nice for stuffing cushions or toys for the little ones. In this way very little of this valuable animal is wasted, most of it being used up on the farm, with a small amount of labour and very little expense.

# Orchard Notes for November.

## THE COASTAL DISTRICTS.

NOVEMBER is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few lines, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil, and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely ground phosphatic rock to the acre, and if the soil is deficient in lime a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time, so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens, it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Acts, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

KEEP the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

# Farm Notes for November.

Field.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant

has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

## TUBERCULOSIS IN PIGS—MEASURES FOR CONTROL.

There is no practical method of treatment of tuberculosis in animals, but by attention to the following precautions the disease may be kept under control in the piggery.

1. As cattle are the main source of infection, the tuberculin test should be applied to the herd and all reactors removed.

2. Do not allow pigs to roam about pastures and yards used by cattle unless it is definitely known that there is no tuberculosis in the herd.

3. All skim-milk and other dairy products should be heated to 180 degrees Fahr. and kept at that temperature for fifteen minutes before being fed to pigs.

4. All refuse, slaughter-house offal, and similar food should be boiled before it is given to pigs.

5. In view of the possibility of pigs gaining infection from poultry affected with tuberculosis, pigs should not have access to runs used for poultry.

6. Where tuberculosis is found to be present in the herd, all suspected animals should be slaughtered, and where this is done under qualified supervision the carcases which have only a slight infection of the head glands will be passed for human consumption, the affected parts only being condemned. The pens should be thoroughly disinfected and lime-washed, disinfectant being added to the lime. All litter and rubbish in the yards should be burned and the ground loosened and treated with quick-lime.

7. In the case of stud pigs, if tuberculosis is suspected of affecting any of the animals, arrangements should be made to test the whole of the pigs. The reactors could then be removed.

Fresh air and sunlight are great enemies of the tubercle bacillus. Hence pens and sties should be open and airy, and have no damp dark corners to which the air and sun cannot penetrate.—A. and P. Notes, N.S.W. Dept. of Agric.

## CLIMATOLOGICAL TABLE—AUGUST, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. | | | | | | Rainfall. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Means. | | Extremes. | | | | Total. | Wet Days. |
| | | Max. | Min. | Max. | Date. | Min. | Date. | | |
| *Coastal.* | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| Cooktown .. .. .. | 30·05 | 78 | 68 | 83 | 22 | 57 | 2 | 102 | 5 |
| Herberton .. .. .. | .. | 69 | 55 | 82 | 21 | 37 | 3 | 122 | 10 |
| Rockhampton .. .. | 30·19 | 72 | 54 | 79 | 9 | 42 | 2 | 88 | 9 |
| Brisbane .. .. .. | 30·24 | 69 | 48 | 76 | 9 | 41 | 25 | 90 | 5 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. .. | 30·24 | 66 | 41 | 75 | 30 | 27 | 4 | 131 | 6 |
| Stanthorpe .. .. | .. | 58 | 32 | 70 | 30 | 19 | 4 | 105 | 6 |
| Toowoomba .. .. | .. | 62 | 41 | 74 | 19 | 31 | 15, 25 | 152 | 9 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 30·03 | 84 | 66 | 91 | 31 | 39 | 1, 2 | 74 | 3 |
| Longreach .. .. .. | 30·16 | 72 | 48 | 85 | 31 | 38 | 1 | 25 | 2 |
| Mitchell .. .. .. | 30·22 | 65 | 41 | 77 | 30, 31 | 29 | 5 | 82 | 5 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 30·06 | 83 | 59 | 90 | 19, 30 | 48 | 2, 3 | .. | .. |
| Boulia .. .. .. | 30·14 | 75 | 49 | 95 | 28 | 38 | 5 | 78 | 3 |
| Thargomindah .. .. | 30·20 | 67 | 45 | 81 | 28, 30 | 35 | 2 | 105 | 5 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING AUGUST, 1933, AND 1932, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. | | Total Rainfall. | |
|---|---|---|---|---|
| | Aug. | No. of Years' Records. | Aug., 1933. | Aug., 1932. |
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 0·83 | 32 | 2·71 | 2·08 |
| Cairns .. .. | 1·73 | 51 | 2·77 | 3·55 |
| Cardwell .. .. | 1·24 | 61 | 1·83 | 1·01 |
| Cooktown .. .. | 1·24 | 57 | 1·02 | 0·72 |
| Herberton .. .. | 0·64 | 47 | 1·22 | 1·32 |
| Ingham .. .. | 1·42 | 41 | 1·87 | 1·41 |
| Innisfail .. .. | 4·91 | 52 | 6·18 | 4·10 |
| Mossman Mill .. | 1·27 | 20 | 4·30 | 2·54 |
| Townsville .. .. | 0·50 | 62 | 1·84 | 0 |
| *Central Coast.* | | | | |
| Ayr .. .. .. | 0·56 | 46 | 1·88 | 0 |
| Bowen .. .. | 0·64 | 62 | 2·18 | 0·17 |
| Charters Towers .. | 0·54 | 51 | 0·37 | 0 |
| Mackay .. .. | 1·03 | 62 | 1·93 | 0·48 |
| Proserpine .. .. | 1·27 | 30 | 3·87 | 0·80 |
| St. Lawrence .. | 0·82 | 62 | 0·58 | 0 |
| *South Coast.* | | | | |
| Biggenden .. .. | 1·05 | 34 | 2·41 | 0·22 |
| Bundaberg .. .. | 1·28 | 50 | 1·58 | 0·23 |
| Brisbane .. .. | 2·00 | 82 | 0·90 | 0·38 |
| Caboolture .. .. | 1·53 | 46 | 1·20 | 0·27 |
| Childers .. .. | 1·20 | 38 | 1·69 | 0·19 |
| Crohamhurst.. .. | 2·20 | 40 | 1·40 | 0·97 |
| Esk .. .. .. | 1·49 | 46 | 0·96 | 0 |
| Gayndah .. .. | 1·15 | 62 | 1·46 | 0 |
| Gympie .. .. | 1·73 | 63 | 1·25 | 1·24 |
| Kilkivan .. .. | 1·45 | 54 | 1·45 | 0·40 |
| Maryborough .. | 1·69 | 61 | 1·80 | 0·67 |
| Nambour .. .. | 1·84 | 37 | 1·37 | 0·90 |
| Nanango .. .. | 1·31 | 51 | 1·58 | 0·08 |
| Rockhampton .. | 0·84 | 62 | 0·88 | 0·11 |
| Woodford .. .. | 1·70 | 46 | 1·40 | 0·19 |

| Divisions and Stations. | Average Rainfall. | | Total Rainfall. | |
|---|---|---|---|---|
| | Aug. | No. of Years' Records. | Aug., 1933. | Aug., 1932. |
| *Central Highlands.* | In. | | In. | In. |
| Clermont .. .. | 0·69 | 62 | 0·66 | 0 |
| Gindie .. .. | 0·65 | 34 | * | 0 |
| Springsure .. .. | 1·05 | 64 | 1·59 | 0 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 1·20 | 63 | 1·31 | 0·40 |
| Emu Vale .. .. | 1·11 | 37 | 0·60 | 0·12 |
| Hermitage .. .. | 1·22 | 27 | 0·38 | 0·08 |
| Jimbour .. .. | 1·16 | 45 | 1·24 | 0·17 |
| Miles .. .. | 1·12 | 48 | 1·52 | 0·11 |
| Stanthorpe .. .. | 1·78 | 60 | 1·15 | 0·50 |
| Toowoomba .. | 1·65 | 61 | 1·50 | 0·78 |
| Warwick .. .. | 1·47 | 68 | 0·61 | 0·15 |
| *Maranoa.* | | | | |
| Roma .. .. | 0·92 | 59 | 1·21 | 0·05 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 0·75 | 19 | 0·98 | 0·05 |
| Gatton College .. | 1·14 | 34 | 0·73 | 0·60 |
| Kairi .. .. | 0·86 | 19 | * | 1·34 |
| Mackay Sugar Experiment Station | 0·88 | 36 | 1·66 | 0·35 |

* Not received.

GEORGE G. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

### AT WARWICK.

| | October. 1933. | | November. 1933. | | MOONRISE. Oct. 1933. | MOONRISE. Nov. 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | p.m. | p.m. |
| 1 | 5·33 | 5·51 | 5·3 | 6·9 | 3·30 | 5·14 |
| 2 | 5·32 | 5·52 | 5·2 | 6·10 | 4 29 | 6·12 |
| 3 | 5·31 | 5·52 | 5·1 | 6 10 | 5·28 | 7·9 |
| 4 | 5·30 | 5·53 | 5·0 | 6·11 | 6·26 | 8·6 |
| 5 | 5·28 | 5·53 | 5 0 | 6·12 | 7·24 | 9 0 |
| 6 | 5·27 | 5·54 | 4·59 | 6·13 | 8·23 | 9 51 |
| 7 | 5·26 | 5·54 | 4·58 | 6·14 | 9·20 | 10·40 |
| 8 | 5·25 | 5·55 | 4·57 | 6·15 | 10·15 | 11·24 |
| 9 | 5·24 | 5·55 | 4·57 | 6·15 | 11·9 | a.m. |
| 10 | 5·23 | 5·56 | 4·56 | 6·16 | 12·0 | 12·1 |
| | | | | | a.m. | |
| 11 | 5·22 | 5·56 | 4·56 | 6·17 | .. | 12·32 |
| 12 | 5·21 | 5·57 | 4·55 | 6·18 | 12·45 | 1 5 |
| 13 | 5 20 | 5·57 | 4·55 | 6·19 | 1·29 | 1 36 |
| 14 | 5·19 | 5·58 | 4·54 | 6·20 | 2·5 | 2·7 |
| 15 | 5·18 | 5·58 | 4·54 | 6·21 | 2·39 | 2 39 |
| 16 | 5·17 | 5·59 | 4·53 | 6·21 | 3·9 | 3 15 |
| 17 | 5·16 | 5·59 | 4·53 | 6·22 | 3·40 | 3·54 |
| 18 | 5·15 | 6·0 | 4·53 | 6·23 | 4·12 | 4 43 |
| 19 | 5·14 | 6·1 | 4·53 | 6·24 | 4 45 | 5·42 |
| 20 | 5·13 | 6·1 | 4·53 | 6·25 | 5·23 | 6·47 |
| 21 | 5·11 | 6·2 | 4·52 | 6·26 | 6·5 | 7 55 |
| 22 | 5·10 | 6·3 | 4·52 | 6 27 | 6·57 | 9 4 |
| 23 | 5 9 | 6·3 | 4·52 | 6·28 | 7·58 | 10·14 |
| 24 | 5·8 | 6·4 | 4·52 | 6·28 | 9·2 | 11·16 |
| | | | | | | p.m. |
| 25 | 5·7 | 6·4 | 4·51 | 6·29 | 10·8 | 12·17 |
| 26 | 5·6 | 6·5 | 4·51 | 6·30 | 11·14 | 1·15 |
| | | | | | p.m. | |
| 27 | 5·5 | 6·6 | 4·51 | 6 30 | 12·19 | 2·11 |
| 28 | 5·5 | 6·7 | 4.51 | 6 31 | 1·22 | 3 8 |
| 29 | 5·4 | 6·7 | 4 50 | 6 31 | 2·22 | 4·5 |
| 30 | 5·4 | 6·8 | 4·50 | 6·32 | 3·20 | 5·4 |
| 31 | 5·3 | 6·9 | | | 4·16 | |

## Phases of the Moon, Occultations, &c.

| | | | |
|---|---|---|---|
| 4 Oct. | ○ Full Moon | 3 7 a.m. |
| 12 ,, | ☽ Last Quarter | 2 45 a.m. |
| 19 ,, | ● New Moon | 3 44 p.m. |
| 26 ,, | ☾ First Quarter | 8 20 a.m. |

Apogee, 10th October, at 2.54 p.m.
Perigee, 22nd October, at 10.24 a.m.

On the 5th at midday the Moon will be passing from west to east of Uranus, in Pisces, at a distance of 5 degrees.

On the 14th at 9 p.m. the planets Venus and Mars will reach the nearest point in their conjunction, Mars being only 1·2 degrees north of Venus. Both will be apparently amongst the small stars in the head of the Scorpion. In a week's time they will be more than 2 degrees apart.

(1) The Moon will be passing over Regulus, the principal star of Leo, between 1 and 2 p.m. on the 15th. Their position with regard to the Sun will detract from this as a spectacle for general observers.

(2) On the 16th the Moon will be passing from west to east of Neptune at a distance of 2 degrees and on the 18th at 2 p.m. from west to east of Jupiter at its south side, the apparent distance between the two being 5 degrees.

Antares, the principal star of Scorpio, will be occulted about 3 p.m. on the 22nd when nearly in the zenith at Gympie and within an hour later almost exactly overhead at Roma.

There will be an occultation of Sigma Sagittarii on the 24th after the Moon has set.

Mercury rises at 6.13 a.m. and sets at 6.55 p.m. on the 1st; on the 15th it rises at 6.17 a.m. and sets at 7.37 p.m.

Venus rises at 7.33 a.m. and sets at 8.49 p.m. on the 1st; on the 15th it rises at 7.35 a.m. and sets at 9.21 p.m.

Mars rises at 7.56 a.m. and sets at 9.26 p.m. on the 1st; on the 15th it rises at 7.38 a.m. and sets at 9.16 p.m.

Jupiter rises 5 min. before the Sun on the 1st and sets 13 min. before it; on the 15th it rises 36 min. before the Sun and sets 1 hour 2 min. before it.

Saturn rises at 1.42 p.m. and sets at 3.8 a.m. on the 1st; on the 15th it rises at 1.27 p.m. and sets at 1.53 a.m.

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| | | |
|---|---|---|
| 2 Nov. | ○ Full Moon | 5 59 p.m. |
| 10 ,, | ☽ Last Quarter | 10 17 a.m. |
| 18 ,, | ● New Moon | 2 23 a.m. |
| 24 ,, | ☾ First Quarter | 5 38 p.m. |

Apogee, 7th November, at 9.42 a.m.
Perigee, 19th November, at 11.18 a.m.

The Moon will pass from west to east of Uranus, in Pisces, at 6 p.m. on the 1st, when the planet will be more than 5 degrees southward.

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For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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# Event and Comment.

## Stabilisation of the Dairy Industry.

FROM the farmer's point of view, one of the most important measures submitted to Parliament this session is the Dairy Products Stabilisation Bill, introduced by the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) on 27th October. A similar measure has been presented to the Victorian Parliament, and the New South Wales Government is contemplating similar action. The new legislation is the outcome of certain decisions of the last interstate conference of Secretaries for Agriculture. At that conference one of the major matters discussed was the effect of what is known as the ''Peanut Judgment'' on interstate operations of primary producers' marketing organisations. It will be remembered that a High Court judgment was given some little time ago on an appeal from the Queensland courts in respect of the marketing operations of the Peanut Pool. That judgment defined the sphere of State practice, and mentioned specifically that States are bound by section 92 of the Commonwealth Constitution, which provides for free and unrestricted trade between the federated States.

Against that there is the existing dried fruits legislation, which provides definitely for certain powers whereby section 92 is differently construed. The general belief to-day—and that belief is strengthened by the most recent decisions of the High Court—is that section 92 binds the States, but is not binding on the Commonwealth itself. The Commonweatlh exercised its powers by the passage of the Dried Fruits Export Control Act, by which section 92 is overridden in certain details, and by which State functions are limited in certain directions, except with the legislative concurrence of the Commonwealth Government. The ministerial conference last March, realising the necessity of farmers' marketing organisations being soundly based and insusceptible to legal attack, reviewed the whole question of commodity marketing. The outcome was a recommendation to the Premiers' Conference that the Commonwealth Government be asked to introduce legislation for the appointment of marketing boards in each of the States, similar to that constituted under the Dried Fruits Act, for the control and disposal of primary products. The Commonwealth Government, apparently, was constrained to agree to a general form of organisation if a definite desire for it were shown by any particular industry, and if it were generally acceptable to that industry. Up to the present, only one

definite demand or request has been submitted, and that by the dairy industry. The real point involved is the application of the dried fruits legislation to the dairy industry of the whole Commonwealth. Further consideration was given to three questions: Fixing a limit of production below which any scheme for stabilisation will not apply; fixing a maximum price for local consumption; and fixing a period for the duration of the scheme. All the States have agreed to the basic principles of the Queensland Bill.

The object of the proposed legislation is to stabilise the dairy industry throughout the Commonwealth, which, of course, is beyond the power of one State. The equitable determination of home prices and the limiting of fluctuations in export parity are the general underlying principles of the new legislation. While it provides for a common basis of action, variations in domestic practice in the States concerned will be recognised. Its period of operation is limited to three years. Under the new measures, State organisations are supplanted to a great extent by a Commonwealth organisation within which State organisations will function.

All this was explained by Mr. Bulcock in his introductory speech. He expressed a belief in an Australian parity for butter, and regarded the old idea of fixing our domestic price on the violent fluctuations of the overseas market as unfair to the producer and consumer alike. Victoria was, apparently, reluctant to come into the stabilisation scheme. "To-day," said Mr. Bulcock, "the three Eastern States of the Commonwealth are legislating in this direction, and we are asking the Commonwealth Government to proceed with the other necessary legislation as soon as possible."

## The Stabilisation Scheme.

EXPLAINING the Bill further, Mr. Bulcock said:—

The scheme is not an elaborate one. It provides for the setting up of a stabilisation board in Queensland. It was never my intention or desire to create a new board. We have elected representatives of the dairying industry on the Butter Board and Cheese Board, and a judicious selection from these people—allowing the selection to rest with them—will meet all requirements so far as the Queensland Board is concerned. Representatives from this board will function on the Commonwealth Board. The whole idea is to allocate quotas to the various States of the Commonwealth in respect of domestic consumption and export. The quotas will be decided on the requirements of the various States and on the production of the various States. Each State will take its fair share of export parity, and each State will get its fair and reasonable share of domestic consumption. Such a scheme does not involve the transference of a dairy commodity from one State to another. The scheme will be carried out by bookkeeping transactions, with transfers of quotas to the domestic side or to the export side, as the case may be. The machinery that will be utilised will be the machinery that will be evolved by both Commonwealth and State Governments. The objective will be achieved, I think, in a way that will meet with the satisfaction of those people engaged in dairying practice, and it will not operate to the disadvantage of the consuming public.

There is one further matter that I should like to mention at this stage. It is in connection with the Paterson scheme. For some time we have been operating a scheme whereby an effort was made at stabilisation, but some people have contended—and rightly so, I think—that the Paterson scheme could not survive any great increase in the proportion of butter that is exported overseas. I believe that viewpoint to be the correct one. The Paterson scheme on the present expansive export will probably not survive more than another couple of years. If then the Paterson scheme is to fail it becomes necessary to have a scheme which will function side by side with the Paterson scheme, and ultimately when it fails, to take its place and act as a stabilising influence on the Australian market. There is nothing inherently wrong with the Paterson scheme, but the distribution of domestic and export quotas obviously must kill it in the final analysis. . . . This is a very genuine effort on the part of the Australian States to establish an Australian stabilised price of butter. It can succeed. We have the machinery that has been in successful operation under the Dried Fruits Export Control Act to indicate the course we must take. In Queensland we have the domestic machinery to enable us to operate this scheme. I feel some gratification in the fact that the necessity for this move has been realised after many years. I know that the ex-Minister (Mr. Harry F. Walker), the hon. member for Cooroora, was ultimately interested in this matter, but Victoria was the major stumbling-block at that time. This difficulty has been overcome, and the stabilisation which will be achieved under this Bill will be of very considerable benefit indeed, not only to the people engaged in the dairy-farming industry in Queensland, but also to all those in the Commonwealth.

## Dairying in Queensland—Another Record Year.

YET another annual record has been achieved in dairy production, the factory output of butter exceeding that of the previous year by nearly 5,000,000 lb., notwithstanding the climatic vagaries that contributed so much to comparatively low-crop results in other branches of husbandry. The actual outturn from our butter factories was 100,028,578 lb., as against 95,050,738 lb. for 1931-32, and 92,894,101 lb. for 1930-31; yet, as suggested, seasonal conditions were against high production. General rain, so important to the maintenance of an average output, was not experienced in dairying districts. Generous storm rains in some areas varied with light and patchy falls in others. The summer was unusually hot and dry, to the detriment of grass and fodder crops, and, consequently, to the quality and volume of the product and the regularity of supplies.

The sharp upward curve in the production chart is attributed to the entry into the industry of farmers who had previously limited their operations to grazing and/or general argriculture. Low wool and meat values and the unfavourable season for arable farming forced both the grazier and agriculturist into dairying, especially on country conveniently situated within a butter factory zone. Another important factor that influenced output was the opening and occupation of large areas of Crown lands in different parts of the State. The development of the industry in the tropical coastal country from Mackay northwards was another contribution towards the attainment of the "peak" in butter tonnage.

In his annual report to the Minister, Mr. E. Graham, Under Secretary and Director of Marketing, calls attention to the foregoing facts, and remarks further that in North Queensland the industry is advancing rapidly and on a high plane of technical efficiency. This remarkable development of dairying within the tropics was mentioned in his last review, and he has the satisfaction of reporting still further progress. Climate, soil, and other natural advantages, together with the adoption of modern methods in dairy practice, are making Queensland a great dairying country.

From Mr. Graham's review of the year in dairying, we learn that grading records show considerable improvement in quality and a commendable uniformity of factory products. The body, texture, and general condition of butter were satisfactory, an indication of a high degree of efficiency in the manufacturing side of the industry.

Hugh summer temperatures affected detrimentally the quality of a proportion of the cheese outturn. The disadvantages of hot weather can be minimised by a wider application of the information disseminated by the Department, and this was an important point in its instructional programme. It is noteworthy that most dairy farmers deliver a high-grade milk to the cheese factories, thus demonstrating that the difficulties of cheese production in a sub-tropical climate can be successfully overcome. There was an appreciable increase in the cheese output for the year, the aggregate being 13,079,996 lb., as against 11,006,663 lb. for 1931-32. The services of the Departmental instructional staff proved effective in increasing the quantity of first-grade cheese manufactured during the period.

Investigatory work in respect to both butter and cheese was an important branch of Dairy Branch activities in the course of the year. Short refresher courses for dairy factory employees and dairy farmers were well attended, and their beneficial influence on the industry is undoubted. Herd-recording was continued energetically, a new departure being the enlisting of the co-operation of dairy factory managements in this important work. Breeders of stud dairy cattle are making greater use of the facilities afforded by the Department in respect of advanced register recording.

The amendment of the Dairy Produce Act, passed last session, has made possible the more complete inspection of dairy factory accounts, resulting in uniformity in the compilation of annual returns. The general inspection disclosed that sound methods of accountancy are the rule in all factories.

Under amending legislation, the payment of freight on cream by co-operative dairy associations was abolished in the course of the term under review.

In the course of the year "*The Dairy Cattle Improvement Act of* 1932" became law. Its object is to assist dairy farmers to head their herds with bulls bred on production lines, to extend the herd-recording service, and to co-operate with the Animal Health Station in the control or eradication of stock pests and diseases.

The establishment of the Dairy Committee Scheme was an addition to the educational activities of the Department. The scheme has been generally approved by local producers' associations, and 105 local committees have been formed under an acknowledged leader in the industry.

# Bureau of Sugar Experiment Stations.

## CANE PEST COMBAT AND CONTROL.

BY EDMUND JARVIS.

*It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.*—EDITOR.

### GREYBACK CANE BEETLES EMERGE FROM THE GROUND—FIRST APPEARANCE OF EGGS AND YOUNG GRUBS IN CANE LAND.

Our first heavy rains often fall in November, and in the event of September and October having been dry months a precipitation of 3 or 4 in. is invariably followed by a primary emergence of this beetle pest. If rain comes early in November, but lasts only a few hours, we may expect a secondary emergence later on, after another downpour, either at the end of November or early the following month. During September the pupæ of the cockchafer were mostly in evidence (see Plate 59), while the month of November is characterised by the occurrence of multitudes of the beetle-form of this pest patiently awaiting underground the coming of rain which will enable them to reach the surface and take to wing. Should dry weather continue, however, throughout November, a certain percentage of greybacks chancing to occur in light soils of high porosity can still manage to escape imprisonment. Such specimens can easily be distinguished by their dark reddish-brown colour, which is due to the white body scales having been rubbed off by contact with the hard dry earth during the course of their difficult passage upwards.

It will be seen from the following table that primary emergencies of this cockchafer may happen as early as 15th October, or as late as the middle of January:—

*Record of Past Primary Emergences of Greyback Beetles.*

| Year. | Month. | Year. | Month. |
|---|---|---|---|
| 1914 .. .. .. | 5 December | 1924 .. .. .. | 13 December |
| 1915 .. .. .. | 11 December | 1925 .. .. .. | 18 November |
| 1916 .. .. .. | 7 November | 1926 .. .. .. | 18 December |
| 1917 .. .. .. | 29 October | 1927 .. .. .. | 20 December |
| 1918 .. .. .. | 15 October | 1928 .. .. .. | 12 November |
| 1919 .. .. .. | 15 January | 1929 .. .. .. | 19 November |
| 1920 .. .. .. | 5 November | 1930 .. .. .. | 30 November |
| 1921 .. .. .. | 2 December | 1931 .. .. .. | 27 December |
| 1922 .. .. .. | 22 December | 1932 .. .. .. | 15 December |
| 1923 .. .. .. | 7 December | | |

Although November and December are evidently the two principal months for its appearance on the wing, its existence occurs most often during December. In years when "flighting" happens to take place towards the end of the latter month, it is worth noting that such conditions are likely to favour subsequent fumigation of its grubs by curtailing the activities of this pest during such late seasons to a single emergence of the beetles.

#### Factors Influencing the Migration of Greyback Beetles.

The natural laws which govern the movements of certain insects are too complex to deal with here, but it may be stated that several species, including our greyback beetle, when chancing to multiply abnormally over restricted areas, sometimes seek to migrate to fresh fields, and thus ensure a wider distribution of eggs. By establishing their grubs or larvæ on different kinds of soil they may thereby lower the percentage of mortality caused by natural enemies or obtain greater abundance or variety of food.

It will be of interest to mention that the grub-infestation of cane lands surrounding the Mulgrave Mill was apparently effected in the early days by greybacks that migrated there from extensive breeding grounds lying to the south of Aloomba, between the Malbon, Thompson, and Pyramid Ranges. Fully one-third of this area of about 80 square miles consisted at the time of reserved land, including much virgin scrub, uncleared forests, and open country supporting native grasses, &c.

The plate for November illustrates the awakening to activity of the first lot of gerybaek cockchafers, eggs being laid, beetles emerging from the ground, and feeding on eucalyptus leaves.

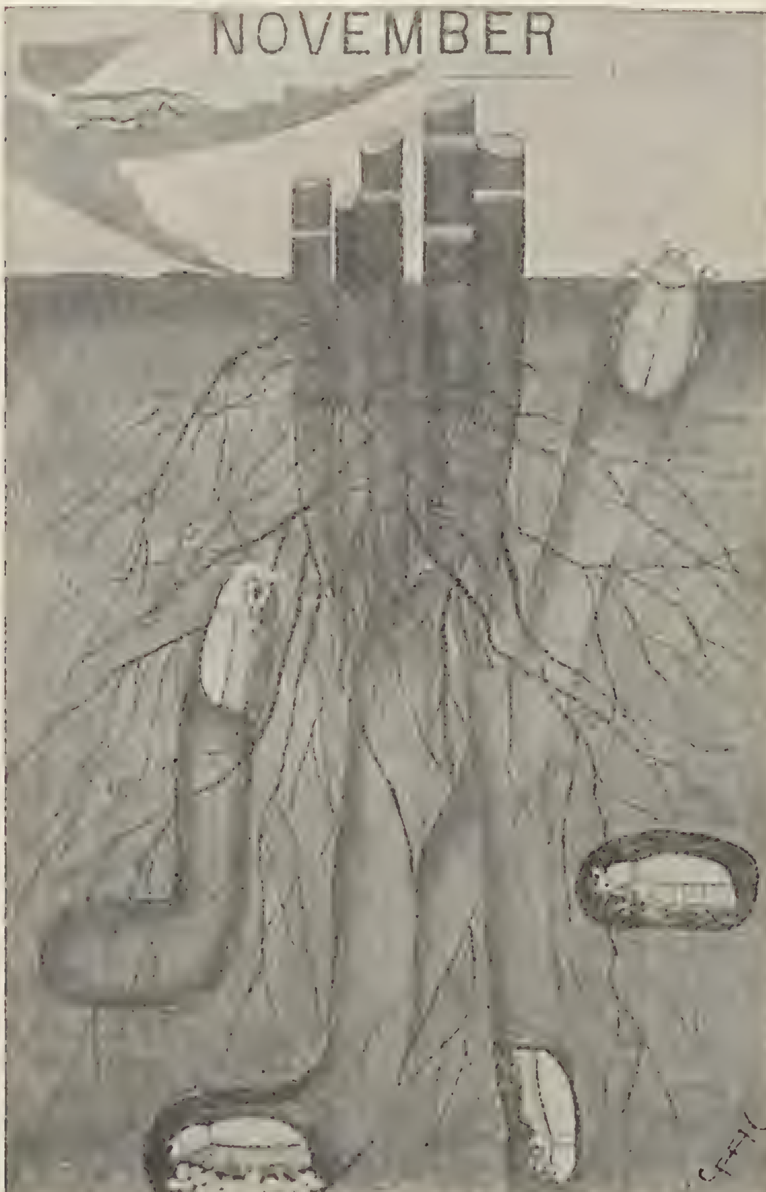


PLATE 111.—Showing activities of the greyback beetle about a fortnight after the first heavy fall of rain. Specimens (left to right) (1) escaping to the surface from cell; (2) laying eggs; (3) tunnelling downwards to oviposit; (4) reaching the surface; and (5) not yet ready to emerge from cell.

# Fertilizers for Sugar Cane.

By H. W. Kerr.

IT has been pointed out on several occasions that the cane soils of Queensland are not possessed of the high degree of fertility which is so frequently attributed to them. Certainly there are restricted areas of highly productive soil, such as portions of Freshwater and the Burdekin Delta; but, in common with other tropical lands of heavy rainfall, the plantfood supply of the soil has been rapidly depleted, due to the excessive leaching to which they are subjected; the first flush of high productivity for which they are noted when first brought under cultivation rapidly passes, and the farmer must then pay very close attention to the maintenance of fertility if he would continue to harvest satisfactory crops.

Although a large proportion of our canegrowers are consistent users of fertilizers, there are still many who do not devote to these materials the attention which their importance demands. It is pleasing to note that the early prejudices which were entertained against these valuable materials are rapidly disappearing; but even to-day artificial manures are spoken of as crop stimulants—substances which transmit to the crop an unhealthy growth impetus, and which will eventually ruin the land. Used wisely, nothing could be further from the truth. Fertilizers are simply concentrated forms of plantfood, the application of which to the land serves but to restore something of the fertility which continuous cropping to cane removes from the land.

Sugar-cane must be regarded as a gross feeder on the plantfood of the soil. Calculations based on analyses show that a ton of cane removes as much plantfood as would be supplied by 25 lb. of mixed fertilizer. A 30-ton crop would, therefore, deprive the soil of the equivalent of 750 lb. of mixed manure. Is it to be wondered, then, that the harvesting of heavy cane crops without heavy manurial applications to the land soon results in rapidly declining crops?

It has been shown that crops extract from the soil seven plantfood materials which are absolutely essential to growth. If one of these is lacking, crop production is impossible; if one or more is present in deficient amounts, yields are reduced proportionately. In practice it is found that three of these plant foods in particular are likely to become factors limiting crop growth; they are nitrogen, phosphoric acid, and potash. It is for this reason that *mixed* fertilizers contain these three plant foods in varying proportions. Other manures, such as superphosphate or sulphate of ammonia, supply only one of these particular foods.

As might be expected, soils vary widely in their ability to supply the desired amounts of these individual foods, and, therefore, the particular fertilizer mixture which will give most profitable results will vary in composition for different soil types. Thus the red volcanic soils of this State show a consistent deficiency with respect to potash, and a suitable mixed fertilizer should, therefore, be rich in this plant food. On the other hand, the acid alluvial soils of North Queensland exhibit very marked response to heavy applications of phosphates, but are able to provide for the potash needs of heavy crops of cane without substantal dressings of this plant food.

The determining of the particular requirements of the major soil types of the sugar areas has been one of the projects pursued intensively by the Bureau during the past four years. Fertilizer trials have been established on suitable areas of typical soil, and on the basis of the crop yields from the several treatments we have been able to select that fertilizing mixture which might be expected to return the grower the maximum profit for the value expended. In the far northern areas our trials have been particularly successful, and we are able to advise growers with a reasonable degree of certainty just what their soil most requires. This is certainly true for the red volcanic, alluvial, and gravelly soils of those parts. As regards the red schist soils, which rival the alluvials in point of importance in those districts, our results have not been so clear-cut. Certain of these soils exhibit marked response to potash-rich mixtures, while others—often not more than a mile away—have been found to be distinctly deficient in available phosphates, while the increased yield due to potash is of minor importance. It does appear, however, that our laboratory chemical tests on soils of this type reflect these conditions, and we would urge growers farming this particular type to submit samples to our laboratories for analytical purposes and advice.

If any doubt exists in a grower's mind as to whether the fertilizer he is using is suitable for his particular conditions, he should consult our Field Officer or Station Chemist, who will advise him of our findings, or will undertake to submit a soil sample for analysis should this course be deemed advisable.

The soils of the Burdekin area have already been mentioned. Here it is found, by field trial, that the richer soils of the area show but slightly increased yields from phosphates or potash, but phenomenal increases have been recorded following applications of sulphate of ammonia. This is particularly true of ratoon crops. One such experiment harvested during the present season showed 39 tons of cane per acre unfertilized, and 53 tons per acre where liberal dressings of sulphate of ammonia had been given. It now appears quite definitely that the failure of ratoons in that district is attributable in a large measure to inadequate supplies of plant food early in the lifetime of the ratoons, and this is especially true of the plant food nitrogen.

Our results in the central and southern areas have not been so complete as those in the far northern districts. This is doubtless due to the decidedly droughty conditions with which these areas have been afflicted during the period under review. It must not be concluded, however, that our results have supported the oft-repeated statement that fertilizers are not required on these soils. On the contrary, it might be demonstrated that in a dry year the richer soil definitely outyields the poorer one; but the fact is that soil moisture has been so seriously deficient that the added plant food was not able to demonstrate its true value. It is hoped that a return of favourable seasons may enable us to prove this contention in no uncertain manner.

For the present we can only state that the red volcanic soils of these parts require a mixture rich in potash, and that forest sandy loams are usually lacking in available phosphates.

So far very little has been said regarding nitrogen—the plant food supplied by sulphate of ammonia. Our experiments have shown that practically all soil types give markedly increased yields where this

material is applied. The nitrogen content of the land is intimately associated with the soil humus; and soils deficient in humus are, therefore, deficient also in nitrogen. This is particularly true of older lands, on which continuous cultivation over a period of many years has resulted in a rapid loss of humus. The ploughing-under of green manure crops on all soil types is to be definitely encouraged, therefore, if for no other reason than that the practice affords a cheap and ready means of building up a supply of available nitrogen in the soil. Indeed, we have found that, where a good crop of beans or peas has been ploughed under and rotted prior to planting cane, very slight response to added sulphate of ammonia can be detected.

The favourable influence of the leguminous crop is, however, fleeting; for the subsequent first ratoon crop has almost invariably shown a highly increased yield due to top-dressings of sulphate of ammonia. This fact should, then, be kept clearly in mind—that, although the plant cane may find all of the nitrogen which it requires for its growth, the ratoons will certainly benefit from application of this plant food. On certain of our soil types we have found that applications of 600 lb. of sulphate of ammonia per acre to ratoons are profitable. This is, of course, applied in two or three light dressings.

As regards the time and manner of applying fertilizer, we would suggest the methods which have been followed in all of our trials with success. To make best use of the supplementary plant foods applied in this manner, the crop should be able to draw on them as early as possible in its lifetime. For plant cane we would, therefore, recommend that the manure be placed in the drill with the cane plants; for ratoons, apply in a furrow 3 or 4 in. deep run close to the line of stools at ratooning time. Our experiments show that fertilizer applied early may result in added crop yields of several tons per acre, as compared with the same manure applied later.

This recommendation regarding the placing of the manure is not strictly accurate. In other words, we recommend that all phosphates and potash be applied at planting or ratooning time, together with a proportion of the nitrogen—for preference, in the form of meatworks manure. The bulk of the nitrogen is applied later in the form of top-dressings of sulphate of ammonia. It is found that best results follow this method of fertilizer application, and sulphate of ammonia appears to give maximum increases when applied in dressings each of 1 bag per acre. Thus it is desirable to apply such a dressing when the plant cane is stooling, and probably another of similar amount from four to six weeks later. For ratoons, an application should be made shortly after ratooning, and in this case two further dressings—at, say, monthly intervals—should be given. It should be remembered that heavy dressings of sulphate of ammonia applied late in the season result in delayed maturity and marked reduction in the c.c.s. of the crop. As far as possible, growers should aim at completing their fertilizing programme before Christmas time. Sulphate of ammonia may be applied—always as a top-dressing—even in dry weather; it is then ready for absorption by the soil with the first rain that falls, and becomes of benefit to the crop immediately.

# Maori Mite Control.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

IN most of the citrus districts of this State the mite, which produces the skin blemish on citrus fruit known as "Maori," commences to breed freely about this time of the year (November), and many orchardists will need to combat the pest in the near future if they are to harvest clean fruit next year.

## The Maori Mite.

Though the effect of the feeding of the "Maori" mite is well known to almost all Queensland citrus growers, there are a large number who are not familiar with the pest itself. Unfortunately, by the time the fruit shows sufficient evidence of damage to attract notice, it is usually too late to accomplish much by controlling the pest. Growers should, therefore, familiarise themselves with the appearance of the mite, and also learn at least the essential points of the life history.

The eggs are laid on the leaves and fruit and are generally placed in the less exposed positions thereon. They are minute spherical bodies, scarcely visible to the naked eye, and are usually found only when in a group and then only by a person using a lens.

The young mites and the adults are very small creatures and usually it is a colony that is found rather than one individual mite. With the aid of a lens they can be seen to be rather wormlike creatures, tapering towards the posterior end. The body has the appearance of being composed of a series of rings or hoops, each hoop being divided into two as it nears the under part of the body—i.e., there are twice as many rings on the under surface as there are on the upper surface. The mites are about three times as long as broad, and the colour varies from cream to a fairly deep yellow.

The mites move about somewhat freely, but do not appear to migrate far from the site on which they were hatched. Thus a colony may gradually build up on one part of a fruit, and ultimately enormous numbers may be present on that part, whilst the remainder of that fruit is quite free of the pest.

The mite moults twice as it grows to maturity and the cast skins commonly remain on the plant amongst the colony. The presence of these white cast skins is quite characteristic, and often the skins serve for identification of the cause of a blemished fruit after the living mites have been removed by rain, mechanical rubbing, or other such cause.

## Injury.

The injury is usually confined to the fruit if these be present, but leaves are also sometimes attacked to a marked extent, especially on younger trees. The mites feed by piercing the surface cells of the part attacked, and the injury thus caused manifests itself in characteristic markings. The details of the injury need not concern the reader, but a knowledge of the general appearance of the attacked fruit is of value as a means of identifying the cause in some cases.

On green fruit the injured part at first appears as a somewhat darker area than the remainder of the rind. On orange and mandarin fruit these areas soon turn to a brown varying in depth of colour from light

to almost black according to the degree of attack. On these varieties the colour is sometimes a silver grey in the early stages, but this does not persist.

The damaged portions of lemon fruit are quite different in appearance. On these fruits the injured areas become a silver grey or almost white in colour, and the surface may crack badly, the silvered portion then being made up of a number of small areas, isolated from one another by these cracks.

The damage to the leaves is never of any great moment, but it is useful to know the appearance so that the presence of the mite may be detected earlier than might otherwise be the case. The mites are usually to be found on the lower surface of the leaf only, though the upper surface is sometimes attacked. The damaged leaves at first appear bronzed, a stage which is more often noted on lemons than other varieties, but in most cases the first noticeable damage is when dark-brown patches of irregular shape appear on the leaves. Though there is little similarity, this damage by the "Maori" mite is frequently confused with melanose disease.

In general the greatest injury suffered by growers through this pest is due to the reduction in the grade of the fruit owing to the skin blemishes, whilst in more severe cases the fruit may be rendered unfit for market. At times the infestation is so heavy that the fruit drops from the tree prematurely. There are other effects such as reduction in size and interference with normal juice production.

## Control.

The mites breed very rapidly in the summer months and enormous populations may thus be built up quickly from very few original mites at this period of the year. In typical summer weather in this State the mite may take only a little over a week to complete its life cycle. Generations thus follow one another in rapid succession, and it will be be readily understood that if combative measures are to be at all effective they must be very efficient. Further, it will be seen that even if a very high percentage kill be obtained early in the summer, this does not ensure that further combative measures will not have to be taken later in the season. Actually it is commonly found that no matter how complete the control established in the early summer, there is always a probability that a second application of the lethal agent will be necessary towards the middle or end of that season. Control should be established towards the end of November or early in December. The trees should then be kept under close observation from the beginning of January, at least until the first week of March. If the weather remains warm well into March it is quite possible that the "Maori" mite will remain active enough to cause considerable damage even to the end of that month.

Both sulphur and lime sulphur are effective against the pest. The procedure recommended is to spray the trees with lime sulphur in the latter part of November or early in December. The strength of the lime sulphur depends largely on the weather conditions, but in general the material should be applied at a strength of between 1 in 20 and 1 in 25. If observations suggest that further treatment is needed later in the season, as is very possible, either lime sulphur or sulphur dust may be used. Of the two, at that time of the year, the dust (flowers

of sulphur) has most to commend it. Dusting may be carried out at any time of the day, but the best results will be obtained by working either late in the evening or early in the morning when dew is on the trees. If the wet spray be preferred there is no necessity to use it stronger than 1 in 30, and 1 in 35 suffices unless it is to be applied very late in the season.

Oil sprays are sometimes used to combat "Maori" mite. These sprays at their best are only partially effective for such a purpose and as has been pointed out, the material, to be of any lasting value, must be very efficient. Oils, therefore, should not be used for the control of the "Maori" mite.

## "DONTS" FOR DAIRY FARMERS.

The manager of the Singleton Central Dairy Co-operative Dairy Company, Limited (New South Wales), Mr. G. Searl, gave a list of dairying "dont's" at a recent conference of the New South Wales Agricultural Bureau, which are worth repeating. Some of them are growing whiskers, we know, but good points are always worth repetition. Here is the list:—

Don't use cloths in the dairy—use brushes.

Don't leave skim milk about to go sour.

Don't leave utensils unscalded.

Don't fail to use boiling water to wash out the cloths used to wash the cows' teats and udders.

Don't put milk or cream in the cans which come back from the factory until they have been *scalded,* scrubbed with a brush, and aired.

Don't put a little night milk into the morning's can to fill it up.

Where milking machines are used, don't dip the tea cups in the water used to rinse the milk line—such water may spoil the milk and bring an inspector.

Don't fail to examine the milk pipe line and see that the tinning is perfect.

Don't fail to inspect the corners and crevices of the milking machine.

Don't fail to wash the hands with a clean cloth and water.

Don't fail to study the physical condition of the herd. This is more important than one would think. Especially is this very marked in drought time. The cow has the natural mother instinct very firmly rooted. With the natural resources of the body reduced to a minimum the cow commences much earlier to store up nutriment for the time when the calf arrives. Consequently, an animal which in an ordinary good season would give good milk up to six weeks before calving, would, under dry conditions, commence to reduce her milk yield three months before. A sick cow in the herd will spoil all the product.

Don't fail to examine the water supply used for both drinking and washing-up purposes. An epidemic of "ropey" milk and cream from one district was found to be caused by the wells getting low. They were cleaned out and the trouble disappeared. Low dams or creek holes are likely to give trouble.

Don't wash up with anything but boiling water, and don't rinse the utensils after washing with anything but boiled water, unless very sure that the source is good.

Don't feed on scorched young corn or water-logged saccaline.

Don't keep the cream lorry waiting, and don't let the lorry keep you waiting. Early delivery to the factory ensures quick treatment. Late deliveries have to wait in the lorries in the heat and so deteriorate.

The roadside pick-up should have a proper shelter, either built or thick foliaged trees. In the case of milk, one hour standing still is worse than two hours moving along.

# Potato Diseases.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

THE potato, unlike most agricultural crops, is grown from tubers and not true seed. The tuber, being a vegetative portion of the plant containing abundant food and also a high degree of moisture compared with seeds, forms an ideal means for the survival of plant disease from one crop to the next, and the spread of disease from district to district. The importation of potatoes from the older countries has in the past brought the majority of the diseases of this crop to Australia. Strict quarantine measures are now enforced to debar the entry of the few remaining serious diseases.

Potato diseases are caused by the action of parasitic fungi and bacteria and by infectious viruses. There are also a number of disorders, known as physiological diseases, which are due to unsuitable conditions of growth or storage. The diseases occurring in Queensland are discussed in the present article, and brief reference is also made to two diseases not yet recorded in this State.

## IRISH BLIGHT.

This disease, which was responsible for disastrous famines in Ireland when that country was dependent on its potato crop, is still capable of causing the most devastating effect on a crop, when no adequate control measures are adopted and conditions suit the disease.

### Symptoms.

Irish blight is first recognised as black spots on the leaves. These spots may be dried out by the sun, or may spread to involve all the leaf tissue, the leaf stalks, and finally the stem (Plate 112). When the stem is severely attacked the plant dies right down to the ground. The tubers if present may be affected either by the disease spreading down through the underground stems, or by direct infection of exposed surfaces before or after digging. The tuber symptoms consist of a sunken and darkened skin, beneath which are areas of brown tissue extending to varying depths into the potato. Under moist conditions of storage the tubers may rot away completely.

### Cause.

The disease is caused by the fungus *Phytophthora infestans,* which in moist weather produces spores on the surface of the black spots just described. The spore producing portion can be seen with the unaided eye as a delicate white down. The spores themselves, which can be regarded as minute fungus seeds, are blown about and alight on leaves and other portions of the plant, and if moisture such as a drop of dew is present they germinate. Germination consists of sending out a thin hairlike tube which penetrates the plant and grows about inside the tissues, killing the parts invaded. Finally it comes to the surface to produce the spores already mentioned.

### Contributing Conditions.

It will be readily realised that moisture is necessary for the development and spread of the disease. In addition to moisture, the temperature is an important factor. It is one of the diseases which are favoured by

Plate 112.—Potato Leaf Affected with Irish Blight.

cold weather. In Southern Queensland two crops of potatoes are normally grown, one in the Spring and the other in the Autumn. Irish blight is liable to be serious in the cooler months of these two growing periods, i.e., early in the development of the Spring crop or late in the development of the Autumn crop. On this account the name, Late Blight, by which the disease is known in colder countries where but one crop (Summer) is grown, is inappropriate in Queensland. Hence the use of the alternative name, Irish blight.

### Control.

The use of sound seed and rotation of crops are important in the control of Irish blight, but the principal control measure consists of preventing the entry of the disease to the plant by the maintenance of a protective covering of spray. The most successful spray to use is Bordeaux mixture, though Burgundy mixture may be used if any difficulty is encountered in obtaining good quick lime. The spray is a preventive and not a cure, so should be applied to the plants regularly before the disease appears. If the disease is present to the extent of a few leaf spots only then spraying will check its spread, but if it is severe nothing will eradicate it from the plants. Directions for the preparation of the spray are given at the end of this article. It should be applied three to five times during the growth of the crop, the frequency depending on the weather conditions, less frequent sprayings being required during dry weather. Plants should not be sprayed when they are wilting from want of moisture or some spray burn may result.

## TARGET SPOT.

The first disease dealt with caused a spotting of leaves during the cooler weather. Target spot also causes leaf spotting, but is most common in the hotter months. Its effect on the plants is not nearly so severe as that of Irish blight, from which it can be distinguished by the more definite outline of the spots and by their having a number of concentric rings resembling a target. Unlike Irish blight, the stems and tubers are very rarely affected. The disease is caused by the fungus *Alternaria solani*. The same spray schedule as advised for Irish blight will hold target spot adequately in check.

## FUSARIUM WILT AND DRY ROT.

Fusarium wilt in the field is typified by the drooping of individual plants as though they lacked water. On cutting the stem of an affected plant it will be seen to have a number of internal brown streaks running along it corresponding with the water conducting vessels of the plant. The tuber stage of this disease consists of an irregular dry brown rot with obvious patches of white or slightly coloured mould either on the surface or in internal spaces in the tuber. The diseases are caused by closely related fungi *Fusarium* spp., the wilt in the field being due to *F. oxysporum*, and the tuber rot to this and a number of other species. It is the latter stage which is sometimes serious in Queensland, the wilt being rarely met with. The control of the tuber rot consists of bagging only sound healthy tubers and careful digging and handling to avoid all injury to the skin of the potato.

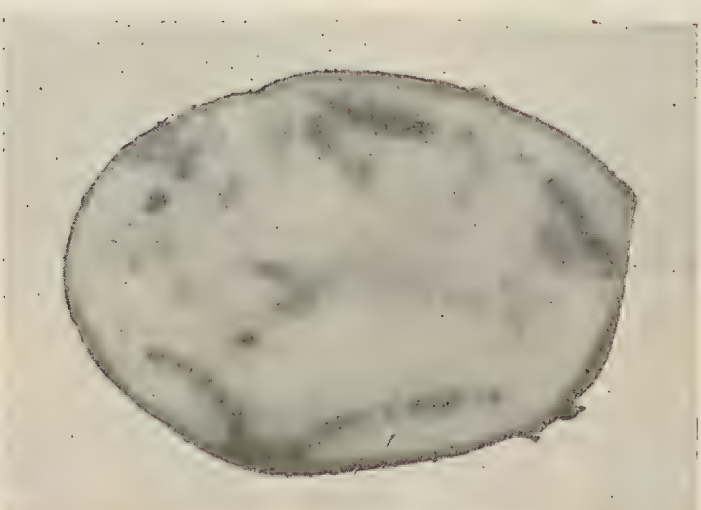

PLATE 113.—BACTERIAL WILT.
Fig. 1.—Potato plant exhibiting foliage symptoms.
Fig. 2.—Affected tuber.

## BACTERIAL WILT.

Bacterial wilt resembles Fusarium wilt in its general effect (Plate 113), but the internal sypmtoms are different. The water conducting vessels are not turned brown, but they are filled with bacteria which appear, on cutting the stem, as drops of ooze on the cut surface. The tuber exhibits a wet rot which under moist conditions in a bag spreads rapidly and destroys the whole tuber, then spreading to neighbouring potatoes. The disease is caused by *Bacterium solanacearum*, and is of somewhat frequent occurrence in Queensland, but is usually responsible for the loss of only a small percentage of the crop. Its control is considered at the same time as that of a second bacterial disease next described.

## BLACKLEG.

The most conspicuous feature of this bacterial disease is a soft black rot of the stem from ground level for six to twelve inches up. The tops above the affected area wilt. The tubers are affected by a soft rot similar to that of bacterial wilt.

Control of the bacterial diseases consists of rotation of crops, care in the selection of seed to use only sound tubers, and good storage conditions for all tubers, but especially those to be used for seed. In the case of blackleg, treatment of the seed to destroy surface borne organisms has been shown to be of some benefit.

## SCAB.

The disease of potatoes most frequent occurring in Queensland is common scab. This disease affects only the tuber, producing cracked and scaly areas, and depressions on the surface of the potato (Plate 114, fig. 1). The trouble does not penetrate deeply and there is little direct loss of the edible portion. However, scabby potatoes will not keep, as the affected area allows the entrance of organisms causing rot, which soon cause the breakdown of the tuber in storage. On this account, as well as the unsightly appearance of the potatoes, all scabbed potatoes should be sorted out when digging, and no attempt should be made to dispose of them by sale in the ordinary way. They may be used for pig food.

### Cause.

Scab is caused by a lowly fungus organism. It forms a delicate surface growth, and the scab is formed by the reaction of the potato to the irritation of the fungus. The organism is introduced on seed potatoes, and survives in the soil for a number of years. It is serious on land having a neutral or alkaline soil reaction, and the acidification of the soil with sulphur has been advocated for the control of the disease. The process, however, is somewhat expensive and it has not been extensively practised.

### Control.

Recommendations for the control of the disease consist of long rotation of crops, seed selection, and seed treatment. If sufficient potato land is available only one crop should be grown in the soil and then it should be cropped to lucerne or other crops for three of more years, when potatoes can again be planted.

Fig. 1.

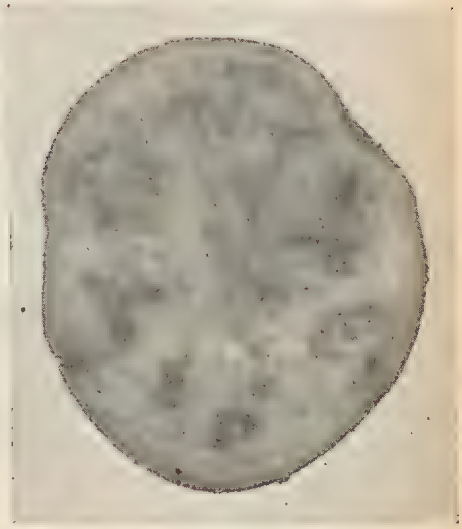

Fig. 2.

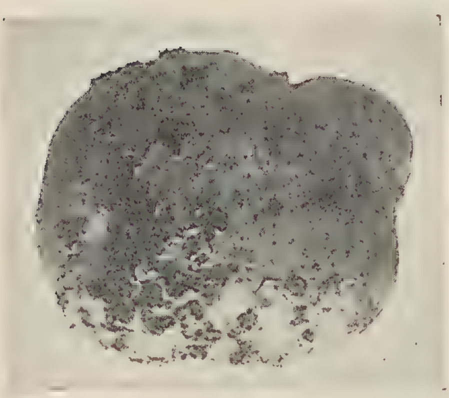

Fig. 3.

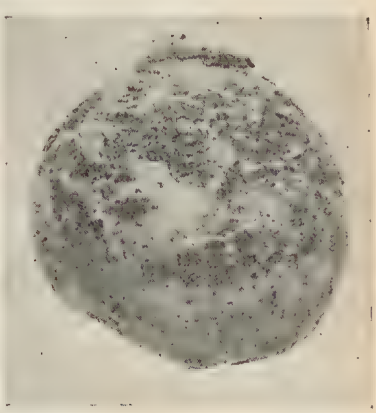

Fig. 4.

PLATE 114.—POTATO TUBER DISEASES.

Fig. 1.—Common scab.
Fig. 2.—Brown fleck.
Fig. 3.—Powdery scab.
Fig. 4.—Black scurf.

Seed should be selected which is free from any obvious signs of scab, and as a further precaution should be treated with hot formalin or acid corrosive sublimate. The details of the strength and method of using these substances are given later. Treatment will effectively prevent common scab and the disease next to be described, black scurf, and it will also destroy a portion of the infective material of other diseases, notably that part which happens to be carried on the surface of the seed tuber.

## BLACK SCURF.

A second type of scab of the potato produces small black lumps on the surface. These lumps resemble black soil, but may be distinguished by the fact that the lumps cannot readily be washed off. They are an intense black colour when wetted (Plate 114, fig. 4). These lumps are sclerotia or fungus resting bodies which revive when the tuber is planted in moist soil. The fungus then produces a mould-like growth which attacks the stalks of the plant about ground level. The affected stalk rots away or, if dry weather supervenes, it shrivels and the top of the plant dies. A common feature of this phase of the disease is the production of aerial tubers, i.e., swellings appearing on the stems of the plant resembling tubers, but being green, soft and useless. The fungus causing the disease, once known as *Rhizoctonia solani,* is now referred to as *Corticium solani.*

The control of this disease consists of the same precautions as are taken to prevent common scab, viz., crop rotation, seed selection, and seed treatment.

## MINOR ROOT AND STEM ROTS.

There are two other fungi occasionally found parasitic on the potato in Queensland, namely *Sclerotium rolfsii* and *Armillaria mellea,* the former causing a rot of the base of the stem very similar to that of black scurf, and the latter a rot of the underground portions. *S. rolfsii* can be distinguished by the presence of numerous white to light-brown sclerotia about the size of small shot. *A. mellea,* on the other hand, possesses brown to black strands having the appearance of a shoe lace. No special precautionary measures are warranted.

## VIRUS DISEASES.

The diseases considered so far are caused by fungi or bacteria. The effects of these pathogens are readily observed as conspicuous spots or obvious wilting and death of the plant. The virus diseases on the other hand are often overlooked by the grower, but nevertheless they seriously reduce the crop yield. They present an abnormal appearance including stunting of the plant, rolling, crinkling, yellowing or mottling of the leaves, and the development of numerous close set shoots. These diseases are sometimes known as degeneration diseases and ascribed to run-out seed. In a general sense that is correct, but the running-out is due to the spread of the diseases to a greater extent in each succeeding crop planted from unselected seed. These diseases are actually caused by a virus or infectious agent, individuals of which are so small that they cannot be seen with the highest powered microscopes, and they can pass through the finest of filters.

PLATE 115.

Fig. 1.—Potato plant severely affected with leaf roll.

Fig. 2.—Healthy plant from the same crop for comparison.

The virus spreads through all parts of the plant including the tubers. When such tubers are used for seed, the resultant plant is infected from its inception. The disease will then spread to other plants, being carried by insects such as aphids which suck the sap containing the virus from diseased plants and subsequently turn their attention to healthy ones. Plants infected by this secondary spread of the disease show the symptoms only in those leaves which are developed after infection takes place, and little direct loss results. However, the virus travels down into the tubers, which are then a potential source of serious disease in the subsequent crop. Two virus diseases are commonly met with in Queensland—mosaic and leaf roll. Mosaic is actually a group of diseases which are only distinguished with difficulty, but it is dealt with here as a single disease in order to avoid confusion.

## MOSAIC.

The appearance of a potato plant lightly affected with mosaic is not very different from that of a healthy plant, but the disease is readily recognised in a badly affected plant or when an affected plant is seen growing among a number of healthy ones, when its debilitated appearance is evident by contrast. Its principal symptoms are a crinkling and yellow mottling of the leaves, with more or less stunting and bunching of the plant. The tubers cannot be distinguished from those of a normal plant, but the yield is considerably less when plants are severely affected.

## LEAF ROLL.

As its name suggests, the principal symptom of leaf roll is a rolling inwards or curling upwards of the leaflets (Plate 115, fig. 1). The leaves are abnormally thickened, stiff, and pale in colour. The stiffness serves to distinguish plants affected with leaf roll from those whose leaves have curled due to the effects of dry weather, wilt, or other diseases of the stem which interrupt the supply of moisture to the tops. The tubers on a leaf roll plant are fewer in number and smaller in size, but are otherwise no different from those of a healthy plant.

### Control.

Both mosaic and leaf roll cause considerable reduction in yield and should therefore be guarded against. An infected plant cannot be cured, and no spray is of any use either as a cure or a preventive. Control consists of the use of disease-free seed. This ideal is somewhat difficult of attainment, particularly in a State which is dependent on an external source of supply for the majority of its seed. In other countries elaborate schemes of seed certification have been evolved to produce seed of a high standard of freedom from virus disease and other defects. Such a scheme is warranted only when the demand exists for high-class seed at an advanced price.

For the grower producing his own seed a capital stud plot is advisable. This plot should be at least 100 yards from any other potato crop. It should be planted with the best seed procurable—preferably table sized tubers as these are less likely to affected with a virus than are the small seed. Then in addition to being well worked, it should be gone through at least three times during the growing period and all off-type and diseased plants carefully dug out. The tubers from the remaining plants should then be nearly disease free, and should all be used for seeding the next crop.

## PHYSIOLOGICAL DISEASES.

In addition to the infectious diseases of the potato there are a number of diseases caused by conditions under which the crop is grown. The exact nature of these conditions is not always known, but it is fairly well established that the physiological diseases do not "spread" in the way that the fungous, bacterial and virus diseases do.

## BLACKHEART.

Tubers affected with blackheart are quite normal on the outside, but on cutting are seen to have a black irregular area in the centre. Blackheart is caused by overheating or poor ventilation in storage, and can be prevented by providing better conditions.

## HOLLOWHEART.

This affection is not discernible on the outside of the tuber. but consists of an irregular hollow in the centre of the potato. It is caused by too rapid growth and is not of any particular consequence.

## BROWN FLECK.

As with the two previous diseases potatoes affected with brown fleck are normal on the outside. They have, however, scattered through their substance a number of small, hard, brown portions of tissue (Plate 114, fig. 2). The affected portions do not soften on cooking, and if at all numerous entirely spoil the potato. There are no parasitic organisms present in the brown tissue. The cause is not definitely known, and consequently no means of cure or prevention can be devised.

## GLASSY END.

In tubers affected with this disease the central portions, more particularly towards the stem end, are watersoaked and have a translucent glassy or greasy appearance. The affected area looks dull in contrast to the crisp white appearance of a cut healthy tuber. Such tubers are frequently referred to as being soapy. The affected portions are deficient in starch, and when cooked rapidly break down into an unpalatable mush. The trouble is caused by interruption in the regular development of the potato plant after the tubers have commenced to form. If the plant receives a check in dry weather the tubers will stop growing. When rain falls it may start into secondary growth, or other tubers may form. In either case the earlier formed tubers or portion of tuber give up some of their starch content to the fresh growth, resulting in the trouble under discussion.

## DISEASES NOT PRESENT IN QUEENSLAND.

### Powdery Scab.

Powdery scab resembles common scab in general appearance. It is distinguished by the fact that the scabs are first raised then, after the surface ruptures, exhibit a cavity filled with brown spores from which it derives the name of powdery (Plate 114; fig. 3). Later, when the spores

drop out, it may leave quite deep excavations. Powdery scab is caused by *Spongospora subterranea,* one of the slime fungi. Cold, wet soil conditions are required for the development of this disease. Such conditions are rarely met with in the potato growing districts in Queensland.

### Wart.

Wart is characterised by an irregular dark growth on the surface of the tuber, quite distinct from the various forms of scab, which are comparatively flat. Wart is caused by another slime fungus, *Synchytrium endobioticum.* It is a very destructive disease in Europe, and every effort is being made to prevent its entry into Australia. Control of the disease where it is present consists of the use of resistant varieties.

## GENERAL CONSIDERATIONS.

In spite of the large number of potato diseases which have been recorded in Queensland, relatively healthy crops are often produced with little attention to disease control. However, the average production is low, being in the vicinity of 2 tons per acre as compared with 6 tons for New Zealand. Low rainfall and the prevalence of insect pests are important factors in the low average yield, but the neglect of a few simple precautions to prevent disease also occasions considerable loss. To avoid this loss every grower should follow the following recommendations:—

(1) Procure the best seed available.

(2) Treat the seed with hot formalin or acid corrosive sublimate.

(3) Cut the seed and discard all tubers showing external or internal signs of disease. When cutting seed, have two knives, one being kept in a 5 per cent. solution of formalin while the other is in use. Change the knives occasionally, and after every diseased tuber is cut.

(4) Spray the growing crop at least three times with Bordeaux mixture.

(5) Rotate the potato land to other crops, preferably lucerne.

With regard to spraying potatoes with Bordeaux mixture, it has been found that in addition to controlling the leaf diseases this spray will increase the crop yield, even when no disease is apparent. In numerous experiments including the trials carried out by the Department in Central Queensland, it has been demonstrated that the increased value of the crop will well repay the trouble and expenditure involved in spraying. It is therefore strongly recommended. Lead arsenate may be added to Bordeaux mixture when the depredations of leaf-eating beetles are observed. Home-made Bordeaux mixture should be used, as it is more economical and efficient than the ready prepared article. Directions for preparation are appended. The use of dusts cannot be recommended.

## POTATO SEED TREATMENT.

Two methods are available for this purpose, one using formalin and the other corrosive sublimate. The seed potatoes are treated before cutting. They should be first washed if they have much dirt adhering.

### Hot Formalin.

The formalin solution is made up by adding one pint of commercial (40 per cent.) formalin to 15 gallons of water. The mixture must be then heated to 125° F. and kept at this temperature during the treatment. The seed tubers are dipped into the solution for two and a-half minutes in small amounts in crates or loose gunny sacks, then taken out and the solution allowed to drain back into the treating tank, another lot of potatoes being then dipped. The treated tubers are covered with bags or canvas for one hour to keep the formulin fumes in. They are then spread out to dry before planting.

The even temperature can be maintained with steam heat where this is available. Otherwise a small fire may be built under the tank and carefully regulated, or some of the solution may be kept hot in a convenient boiler and added to the main tank as the solution cools. In any case the temperature must be constantly measured with a good thermometer such as a dairy thermometer, and no more than 5 deg. variation allowed.

### Acid Corrosive Sublimate.

The corrosive sublimate method has the advantage that it can be used cold, but the materials are somewhat more expensive. The solution is made up by dissolving ¼ lb. of corrosive sublimate and 1¼ lb. of hydrochloric acid (spirits of salts) in 12½ gallons of water. A wooden tub must be used as this mixture corrodes metal vessels. The tubers are soaked for five minutes, then spread out to dry. The solution can be used repeatedly but loses its strength gradually, so fresh solution should be made up after ten lots have been treated. Corrosive sublimate is a deadly poison, so great care should be taken when it is used. All treated tubers must be planted to avoid all possibility of their being consumed by any person or domestic animal.

## BORDEAUX MIXTURE.

Bordeaux mixture is the most valuable and widely used spray for the potato. It depends for its action on the formation of a thin film of a copper compound on the leaf. The copper is toxic to germinating fungus spores, but must be insoluble in order to prevent injury to the plant, and in order that it will not be readily washed off. The ideal in the preparation of Bordeaux mixture is the production of a fine gelatinous precipitate which will stay in suspension, and will spread well and adhere to the foliage.

### Formulae.

| | 6-4-40. | 4-4-50. |
|---|---|---|
| Bluestone (copper sulphate) .. | 6 lb. .. | 4 lb. |
| Burnt or quick lime .. .. | 4 lb. .. | 4 lb. |
| Water .. .. .. .. | 40 galls. .. | 50 galls. |

The weaker (4-4-50) mixture is used for regular spraying and the stronger when disease is likely to be severe.

### Preparation.

Dissolve the bluestone in half the required amount of water in a wooden or copper vessel. If crystals are used, this is best done by tying them in a piece of sacking which is left suspended in the top of the

water overnight. Powdered bluestone can now be obtained, which dissolves very readily. Only wooden or copper vessels can be used to contain the bluestone solution, as this chemical will quickly eat through iron. Wooden casks form convenient receptacles.

Slake the lime in another vessel by the gradual addition of small quantities of water, when the heat generated will aid the reaction. After slaking is complete, water is added to make up the remaining half of the total required. Only best freshly burnt lime should be used, as otherwise there is likely to be an excessive amount of useless residue, and the final composition of the spray will be affected. If burnt lime is not available, good quality hydrated (not air-slaked) lime can be used, but half as much again is required. It is usually difficult to prevent burnt lime from becoming air-slaked in moist climates, but this difficulty may be overcome by slaking the lime before it deteriorates, and keeping under water. For convenience in using later, store a known amount in a known volume of water.

The two solutions, bluestone and lime, are poured simultaneously through a fine strainer into a third container, or the spraying vessel, and the mixture stirred well for a few minutes. This method gives a fine gelatinous precipitate which does not readily settle out. If necessary, one solution can be poured directly into the other, provided the latter is kept well stirred during the process. Concentrated solutions should not be mixed before dilution, as the resultant precipitate tends to be of a granular formation and its spreading and adhesive properties are poor. For the same reason the two solutions should be quite cold before mixing. Bordeaux mixture should be used as soon as possible after preparation, as it loses its gelatinous nature after several hours standing and settles out in a granular form.

### Testing.

It sometimes happens that the lime used is of poor quality and the resultant mixture may then contain an excess of bluestone. This must be avoided, as the soluble copper salt is able to cause injury to the plant sprayed. An excess may be tested for by applying blue litmus paper (obtainable from a chemist) to the layer of clear liquid on the top of the spray. If the colour of the paper turns to red, more lime must be added until there is no change. A rough test is given by allowing a clean knife-blade or bright iron nail to remain the mixture for a few minutes. If on removal this shows a brown coating of copper, more lime is required.

### Stock Solutions.

It is sometimes found convenient to make up a stock solution of bluestone and lime: 50 lb. of bluestone is dissolved in 50 gallons of water in a wooden vessel; 50 lb. of quicklime is slaked and water added to make up to 50 gallons. The solutions will keep well if protected from evaporation. One gallon of each will contain 1 lb. of bluestone or lime respectively, on which basis the necessary dilution before mixing for the preparation of any quantity can easily be calculated.

### Insecticides.

Lead arsenate and nicotine sulphate may be added to Bordeaux mixture to give a spray combining both fungicidal and insecticidal properties.

## BURGUNDY MIXTURE.

This spray is more favoured than Bordeaux by some growers, as it is somewhat easier to prepare and can be used when good quicklime is not available. There is little to choose between the fungicidal values of the two mixtures when properly prepared.

### Formulae.

| | 6-8-40. | 4-5½-50. |
|---|---|---|
| Bluestone | 6 lb. | 4 lb. |
| Washing soda | 8 lb. | 5½ lb. |
| Water | 40 galls. | 50 galls. |

### Preparation.

The preparation is essentially the same as in the case of Bordeaux, using the washing soda instead of lime.

The washing soda may contain impurities, and it is therefore necessary to test for excess bluestone as in the case of Bordeaux. As an excess of soda, unlike lime, is known to cause injury in some instances, it is advisable to test the mixture with both red and blue litmus papers. If the blue paper is turned red, an excess of bluestone is present and more soda is required. If the red paper quickly turns a definite blue, too much soda has been used and more bluestone solution should be stirred in slowly until there is no colour change in the litmus.

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# The Brown Cutworm as a Cotton Pest.

By T. H. STRONG, Assistant to Entomologist.

DURING the earlier part of the 1932-33 season, particularly during November, a very serious loss of cotton stand was experienced in many parts of the Callide Valley. Climatic conditions had been such during the previous summer and winter months that serious cutworm developments were to be anticipated with the advent of a favourable spring. The rains of mid-October produced a good supply of weeds in open areas, and, wherever these weeds were not eliminated by cultivation, a large cutworm population developed. Areas such as old wheat-fields that had been previously cultivated and allowed to stand neglected produced a particularly heavy weed growth and enormous numbers of cutworm larvæ occurred therein. It was not uncommon to find as many as fifty or sixty cutworms (*Euxoa radians* Guen.) under one weed in such areas.

The sandy alluvial loams and sandy scrub loams were undoubtedly the most susceptible, though heavy cutworm infestation took place in certain sections of the heavier alluvials. However, little development occurred in fields where the soils were for the most part of very high clay constituency.

Observations were commenced in the cotton areas during the second week of November, when the cutworm attack was in full swing and, though proved statements cannot be made as to the origin of the larvæ, most field evidence seemed definitely to indicate that no considerable larval development will take place in fields of cotton seedlings free of low-growing weeds, such as pigweed, bullhead, or hogweed. Cutworm attack upon cotton seemed to originate chiefly in two ways in the cultivated areas, the one from invasion from weedy areas outside the cotton crop itself, such as headlands or nearby fields, the other from internal or local migration from weeds, growing during the first three or four weeks after the spring rains, within the cotton fields. In the latter category is the problem of cutworm development in areas of "dry planted" cotton.

### Breeding on Weeds within the Cotton Field.

In many of the cases where very heavy and widespread loss took place in the cultivated areas, as distinct from scrub-planted areas, the cotton had been dry planted. It seemed that such areas had not been harrowed soon after the spring rains, and the dangerous weeds had appeared immediately, attracting the attention of the very active moths, which lay their eggs in favourable situations on the loose shaded soil beneath the weeds. Once the eggs hatched, it was inevitable that the cotton seedlings should suffer. In the earliest instar it appears that considerable dispersal of the cutworm takes place before it settles down to feed on a host plant. Thus, whilst many of the larvæ that had hatched were still confined to their weed hosts, the young cotton seedlings had no doubt drawn the attention of quite a few, which, in this early stage, feed in groups on the leaves and do not go down into the soil during the day. Most farmers, however, only became aware of the

trouble when they commenced to cultivate the fields of young cotton and the cutworms, whose weed hosts had been eliminated, began to concentrate their activities upon cotton seedlings. At this juncture severe loss naturally occurred, and farmers usually did not know whether they should continue to cultivate or not.

In scrub-planted areas trouble of a somewhat similar nature arose in the looser loam or sandy loam areas, and much loss of stand was suffered. Here the problem is somewhat difficult to deal with, and efficient elimination of the cutworms from the area must involve some expense and quite a deal of attention on the part of the cotton-grower.

### Migration from Weedy Areas Outside the Cotton Field.

The second way in which cutworm trouble commonly originated during last season was by migration of larvæ from dirty areas of weed hosts in the vicinity of the areas of cotton seedlings. Pressure of population upon the means of subsistence often forces the cutworms to migrate. In one particular case this was observed on an enormous scale, and it occurred very commonly on a smaller scale in various areas of the Callide Valley. In the former case a very heavy growth of pigweed and bullhead had occurred in an old wheatfield in the vicinity of the State Farm. An enormous larval population was produced in this area and, as the host plants were becoming exhausted, a migration involving hundreds of thousands of larvæ occurred. Disaster to the seedling cotton of the State Farm, amongst which no weed growth had been allowed and no cutworm development had occurred, was warded off by the prompt application of very effective control measures. In many sections of the district migration of larvæ took place from breeding centres to areas of "clean" cotton and, for the most part, attention was paid to it rather late by the cotton-grower, and by that time very considerable losses had been incurred.

Before entering upon a discussion of control, a short summary of significant observations made during the attack will be given. The migration of cutworms into the State Farm from the neighbouring weedy paddock commenced about the 12th November, and continued unabated until the first week of December. At this juncture a heat-wave seemed to have a devitalising influence upon the population that remained, and the attack eased off. The larvæ did not appear to thrive when the soil surface-2-inch maximum temperatures ran towards 110° F. for a period. Apparently November, 1932, provided optimum conditions for cutworm development, the atmospheric humidities remaining uniformly low or moderate and soil surface-2-inch temperatures not being excessive. The average of maximum soil surface-2-inch temperatures for November, 1932, was 96° F. as compared with the average for the years 1926-31 of 102° F. This probably explains the prolonged nature of cutworm activity last season.

By the use of furrows and bait the cotton on the State Farm was protected, but where fallowed land adjoined the weedy paddock it had naturally not been thought necessary to draw furrows. Accordingly, enormous numbers of larvæ appeared in this fallowed land, and they displayed a remarkable survival capacity on the plant material that had been turned into the soil. However, during a relatively cool period at the end of November, some of these larvæ began to attack the cotton plants of the adjoining plots. The damage done to cotton plants six to

seven weeks old was remarkable, the stems in many cases being girdled and the plants dropping over at ground level. Though this is not the only case where seedlings of this age were attacked rather disastrously, the circumstances at the time appeared rather remarkable. This particular attack was very efficiently controlled by the application of poisoned bait in little heaps at the base of the plants at the front of the attack and within the attacked zone.

### The Cutworm can be Controlled.

Despite the valuable information that has been obtained and published with regard to the habits of the cutworm and its control, many farmers in the Callide Valley failed to control the pest. The fact that the State Farm not only avoided cutworm development in areas which obviously would be very susceptible if neglected, but also prevented trouble from outside sources or breeding areas, points to the fact that control measures for the insect are very effective. Certainly in this case more attention and labour had to be devoted to the matter than most cotton farmers would be willing to supply, yet the conditions of attack in this case were somewhat abnormal, and few farmers were situated so near to such an enormous breeding ground over which they had no control.

If cotton farmers wish to avoid loss from cutworm attack they must learn the habits of the responsible insect and how to control it, and also they must have on hand, when trouble is anticipated, sufficient of the necessary material—i.e., Paris green, bran, and molasses. In most cases last season when advice was sought on the matter, firstly, the trouble had been allowed to develop too far, and, secondly, materials would generally have to be obtained from Rockhampton, this involving a fatal delay.

Farmers were to be excused, to a certain extent, for an unwillingness to incur expense at this stage of the season, after the experience of the previous year, but it must be remembered that the trouble cannot be removed without a little outlay on materials and the expenditure of some personal effort and attention. It was unavoidable that serious cutworm developments should take place in open areas in the 1932-33 season as the previous dry spell had, through grass elimination, rendered such areas susceptible to heavy weed growth. But favourable conditions for serious development within the cotton fields should not have been allowed, and attack from larvæ migrating from outside areas can be efficiently controlled.

### Control of Weed Growth within the Crop Essential.

The first principle in cutworm control in cotton areas is not to allow conditions favourable to the development of cutworms within the cotton field itself. That is, do not allow after the spring rains any growth of low-growing weeds within the cotton field. If the field has been "dry-planted," the harrows should be run over it as soon as possible after the spring rains, for, during the weeks following these rains, the cutworm moths will be seeking favourable places for oviposition, and such places are in the loose soil beneath low-growing weeds. If these are provided within the cotton field, subsequent dispersal of larvæ will inevitably involve the cotton seedlings. If weeds have been allowed to grow freely through the area and each weed is host to a number of larvæ, it will be fatal to cultivate without following

up quickly with an application of Paris green bait, either broadcasted over the newly cultivated area or sprinkled along the rows of seedlings in that area. This will require considerable expenditure upon materials and labour, and obviously it is better not to allow conditions favourable to the development of the trouble.

### Control by Use of Poisoned Bait and Check by Furrows.

To avoid trouble from larvæ migrating from the weedy areas or breeding grounds, two methods may be employed:—

(1) If such breeding area is more or less limited in extent and migration is of a local nature, efficient control may be obtained by placing little heaps of bait around the cotton seedlings at the front of the attack and in the zone where the larvæ are active. Such an application was made when invasion into areas of young plants occurred on the State Farm. After forty-eight hours an extensive count showed that 87 per cent. of what larvæ could be found beneath the seedlings were actually dead. The attack was very effectively stopped. Attention should be paid to the source of the larvæ, and it may be wise to remove the weeds of the area and follow up with a broadcast application of poison bait. Naturally all applications of the poison-bran bait should be made in the cool of the evening so as to be fresh for the night-feeding cutworms.

(2) If the breeding area is extensive and borders on the cotton field for a considerable distance it may be found possible to draw and bait furrows which will, under favourable conditions, prevent invasion. The effective application of this method is, however, subject to severe limitations. The soil must be in a suitable condition and the furrows have to be well drawn—that is, they must present on the side to be protected a steep face of loose fine soil, surmounted, if possible, by a line of loose earth provided by the opening furrow. A furrow should be first opened with the loose earth thrown towards the area to be protected; then the return furrow should be cut into this, so as to leave the line of earth above a steep face. At least two such furrows should be drawn and baited, and no weed or earth bridges should be left in them. On the State Farm five furrows were drawn, and the first two of these were baited. The first of these collected an enormous number of larvæ, at one stage as many as 150 being counted in a single foot of furrow. Under normal conditions the first furrow would check about 70 per cent. of the migrating larvæ, and very few would reach the third furrow. However, even after a small shower of rain the larvæ could climb the face of the furrow on which the loose soil particles had become caked. After ten points of rain had fallen, considerable counts of larvæ were made in the third, fourth, and fifth furrows, and no doubt some surmounted all five furrows. It is desirable then that the first few rows of cotton in the area being protected should be watched carefully, and if necessary poisoned bait be distributed along them. After rain the furrows should be redrawn and rebaited.

### Preparation of Bait.

The formula for the poison-bran bait is as follows:—25 lb. bran, 1 lb. Paris green, 1 quart molasses dissolved in 2 quarts of water, and more water as required to make a crumbly, well-moistened bait.

The first essential point to be observed in the preparation of the baits is that the Paris green be thoroughly mixed with the bran, this being done while the bran is dry. The molasses is then dissolved in water and is mixed with the bran and Paris green. Further water should be added slowly and mixed in, care being taken that the mixture does not become soggy. It must be thoroughly moistened but not taken beyond the crumbly state, otherwise it will be difficult to scatter.

For light broadcasting at least 50 lb. dry weight of bran per acre is required, while to protect rows of cotton 4½ feet apart, the bait being sprinkled along the rows at the base of the plants, 25 lb. dry weight of bran per acre may be found adequate.

## How to Detect the Trouble.

Unless cutworm damage is detected at an early stage in its occurrence, considerable expense may be involved. Stress must, therefore, again be laid on the necessity for the farmer knowing the insect and its habits. Plants in certain areas may be observed to be damaged, stems and leaves being severely chewed. Sluggish pinky-grey-brown grubs up to an inch or more in size are responsible for this type of injury, and will most likely be found an inch or two down in the soil at the base of the plants. These grubs feed at night time and are the larvæ of dark dirty-grey moths which rest during the day close to the ground either amongst clods or under weeds.

When damage of the nature described has been observed, the probable source of the trouble may be looked for—namely, low growing weeds, such as pigweed or bullhead in the vicinity, whence the cutworms have emerged from eggs laid by these moths. It is not usual for cutworm moths to lay eggs on or under cotton plants, for the moisture and shade provided by low-growing weeds are apparently necessary for breeding under normal conditions.

Frequent applications of fresh poisoned bait must be made while the attack is maintained. With the dry atmospheric conditions of a Callide Valley spring, it is too much to expect bait to remain attractive for more than three days, and it is too much to expect an efficient clean-up with one application of bait.

## WHAT IS AN ACRE.

| | | |
|---|---|---|
| 5 yards by 968 yards .. .. .. .. | contains | 1 acre. |
| 10 yards by 484 yards .. .. .. .. | ,, | 1 acre. |
| 20 yards by 242 yards .. .. .. .. | ,, | 1 acre. |
| 40 yards by 121 yards .. .. .. .. | ,, | 1 acre. |
| 80 yards by 60½ yards .. .. .. .. | ,, | 1 acre. |
| 70 yards by 68 1.9 yards .. .. .. | ,, | 1 acre. |
| 220 feet by 198 feet .. .. .. .. | ,, | 1 acre. |
| 440 feet by 99 feet .. .. .. .. | ,, | 1 acre. |
| 110 feet by 369 feet .. .. .. .. | ,, | 1 acre. |
| 60 feet by 726 feet .. .. .. .. | ,, | 1 acre. |
| 120 feet by 363 feet .. .. .. .. | ,, | 1 acre. |
| 240 feet by 180½ feet .. .. .. .. | ,, | 1 acre. |

# Frog Eye Leaf Spot and Barn Spot of Tobacco.

By L. F. MANDELSON, B.Sc. Agr., Assistant Plant Pathologist.

FROG eye is quite a common disease and occurs to some extent practically wherever tobacco is grown. In most countries of temperate climate it is of little importance or else is only severe in certain seasons, whereas in tropical countries it may be responsible for considerable damage. It is apparently one of the most important leaf-spotting diseases of Nyasaland and Rhodesia, and has become increasingly prevalent in the latter country during the past few years.

In some northern districts of Queensland, such as Sarina, Mareeba, and Ingham, it is second in importance only to blue mould. In severe cases, leaves are practically covered with spots from the ground to the topmost leaf. On the other hand it is rarely observed in Southern Queensland, where it is of no economic importance.

Considerable spotting may occur in the field when environmental conditions are favourable to the development of the disease. An even more serious aspect of the trouble is the further development of spots during the curing process. Consequently in Northern Queensland this disease may considerably reduce the market value of tobacco leaf.

## Cause.

Both frog eye and the barn spot, which develops during curing, are due to infection by the parasitic fungus *Cercospora nicotianae.* This organism is a weak parasite, and the damage it may cause is limited by the prevailing weather conditions and the vigour of the plant. The latter may be considerably influenced by the farmer, and hence spotting is not so severe when good farming methods are practised.

## Symptoms.

In districts where the disease is not of major importance the symptoms are usually observed as roughly circular brownish spots, about half an inch in diameter, with a pale centre upon which are small black specks. (Plate 116.) These specks are masses of spores of the causal fungus. Spots of this nature are frequently found on the lower leaves of the plants. Similar spots may occur on seedlings which have been exposed to infection and have not been adequately protected with fungicides.

Where frog eye is more severe the lesions are usually smaller and more angular. The youngest spots may be observed as minute pale specks when the leaf is examined against a strong light. Later they develop as well-defined brown areas of variable shape and size. At first the spot is uniformly brown in colour. Later a white centre is formed as described above. On the average the spots are about a quarter of an inch across.

The lower and more mature leaves are most susceptible to spotting, but at times even the youngest leaves may be severely blemished, specially at the end of the season.

PLATE 116.—FROG EYE (*Cercospora nicotianae*).
Mature tobacco leaf showing recent infection and well-developed lesions.

The most alarming and usually the most serious aspect of the disease is the development of spots during the curing process. This phenomenon is first observed after the initial twelve hours or so when the leaf is colouring. It is most pronounced as the temperature exceeds 110° F. when the leaf is drying out. Cases have been observed where leaf has been placed in the barn practically free of blemishes and when cured contained more spots than sound normal tissue. The spots which develop in the barn are usually similar in colour although generally larger than young lesions which develop in the field—i.e., they are a uniform brown colour, vary in size from a speck to about half an inch across, and have a well-defined outline, which may be either curved or angular. The colour at times varies from brown to black.

### Conditions Favouring the Disease.

Since this disease is of major importance only in the northern tobacco districts of Queensland and in other tropical tobacco growing countries, it would appear that its optimum development is associated with high temperatures and humidities. It is significant that it does not occur, or else is very rare, in the northern tobacco areas of the United States, whereas it is of sporadic importance in the more tropical southern districts. Furthermore, it is of interest to note that frog eye is of considerable importance in Rhodesia, which is in the same latitude as Queensland, and where weather conditions would be somewhat similar.

The temperature reactions of the fungus *Cercospora nicotianae* which is the cause of this disease also indicate that it would be favoured by high temperatures. It has been observed that this organism attains its greatest development at approximately 80° F. and does not grow at temperatures below approximately 45° F. or above 93° F.

Hence apparently the climate of many Queensland tobacco areas is favourable for the development of this disease. Nevertheless, when several crops in any one district are inspected, it is usually observed that the severity of the disease varies considerably from farm to farm, according to the treatment the crop has received during its growth. Seedlings which are overcrowded, are suffering from lack of nutrition or are weakened in any way are most susceptible to the disease.

Crops which grow steadily from the time they are planted, and mature in a normal period, are least affected by frog eye. On the other hand, when the growth of plants is temporarily or permanently checked their resistance to the disease is apparently lowered.

Factors which bring about this condition are irregular rainfall, especially when cultivation is not thorough, the development of various root troubles, neglect of suckering and the keeping down of weed growth, the planting of seedlings which are not vigorous, and the use of unsuitable land for tobacco growing.

Plants are weakened and consequently more susceptible to spotting when soil aeration is poor, as in seepage country, or where the soil is tenacious and in need of drainage. Furthermore, the severity of the disease is increased when plants are grown on shallow soil which has been deeply ploughed, especially when the subsoil is stirred.

Spotting is most pronounced when light rains or heavy dews frequently occur, particularly when the plants are not growing vigorously. The spores of the causal fungus are washed from frog eye spots to healthy

tissue, and readily germinate and cause infection under these conditions. It has frequently been observed in Queensland, and elsewhere, that severe spotting is associated with wet weather when the crop is maturing. Such conditions delay the ripening of the crop, predispose it to infection, and favour the development of the parasite.

The more mature the leaf tissue the more liable it is to spotting. For this reason the lower leaves are usually most affected. If leaf cannot be harvested promptly when mature because of insufficient barn space or inadequate supply of labour, the disease is more obvious than otherwise.

No varietal resistance has been observed under Queensland conditions.

### Control.

As has been already indicated, unfavourable weather conditions, which naturally are beyond the control of the growers, may check the growth of tobacco plants and so predispose them to infection by this disease. Furthermore, certain weather conditions may favour the development of the parasite and so be responsible for the rapid spread of the disease through the crop.

Nevertheless, by the careful destruction of plant debris and attention to other aspects of sanitation, the original sources of infection may be greatly reduced, and by good cultural methods the effects of unfavourable weather conditions may be considerably mitigated. It is obvious, therefore, that the control of this disease largely involves good farming practices, and consequently the grower should refer to the Departmental publication "Tobacco Growing in Queensland" for detailed information on these subjects.

Some of the more important aspects of the control measures are discussed in the following paragraphs.

### Field Sanitation.

Prior to commencing seed-bed operations all possible sources of infection should be eliminated. It is necessary, therefore, to entirely remove old tobacco plants from the soil within one month after harvesting the crop and destroy them.

When plants are being pulled out of the soil, the stem at times is broken, and the roots remain in the soil. Such roots may send up suckers which will be a menace to the subsequent crop. Consequently, the field should be inspected periodically, and any roots which are discovered should be hoed out.

No volunteer plants whatever should be permitted to grow on the farm after the tobacco season has terminated. The practice of keeping a few tobacco plants in the vicinity of the homestead is dangerous, and may be responsible for introducing the disease into the commercial crop.

Priming will be discussed later, but it may be mentioned here that any leaves which are removed from the growing crop should be carried from the field and carefully destroyed. They should certainly not be permitted to remain between the rows where they will be a source of infection and a menace to the growing crop.

### The Seed-bed.

The soil should be friable and sufficiently fertile to produce quick-growing and robust seedlings. If the soil is not naturally fertile it should be suitably fertilized, care being taken to distribute the fertilizer thoroughly. Seedlings suffering from malnutrition, or weakened from any other cause, are most liable to infection.

### Tobacco Seed and Seed Disinfection.

It is most important that only seed which has been obtained from selected healthy plants should be sown, and if seed is purchased it should only be procured from a thoroughly reliable source.

As an additional precaution seed should be surface sterilised before planting. Sterilisation, however, does not obviate the necessity of care in selecting apparently disease-free seed, since, owing to the minuteness of tobacco seed, some seed may not be thoroughly wetted by the disinfecting solution.

Either corrosive sublimate (bichloride of mercury) or silver nitrate may be used for the purpose.. The seed to be sterilised may conveniently be contained in a bag of cheese-cloth or some such material.

The corrosive sublimate solution is prepared by dissolving one part by weight in 1,000 parts of water. It may be purchased in tabloid form from chemists, and one tabloid dissolved in a pint of water will make a solution of the required strength.

To prepare the silver nitrate solution 9 grains are dissolved in a pint of water.

The times of immersion are five minutes in corrosive sublimate solution or fifteen minutes in the silver nitrate solution.

After treatment, carefully wash the seed in running water or in six changes of clean water, and then spread out on clean paper and dry in the shade.

Crockery or glass, but not metal vessels, should be used for these solutions, and precautions should be taken to keep them well away from children or stock, as both chemicals are poisons.

Seed which is supplied by the Department of Agriculture and Stock is surface sterilised prior to distribution, and hence does not require any further treatment before planting.

### Rate of Sowing.

Faulty sowing of seed predisposes the seedlings to many serious tobacco diseases. Since weak plants are most susceptible to frog eye, correct sowing is also an important aspect in the control of this disease.

The seed should be sown evenly and not too thickly. The majority of growers err in having far too dense a stand of seedlings. If plants are overcrowded they become weak and spindly, more prone to disease, and cannot be efficiently sprayed with fungicides.

It is much safer to sow too thinly than too thickly. When the plants are large enough it is advisable to remove the surplus seedlings and space them at least 1½ to 2 inches apart in other beds..

### Application of Fungicides.

Seedlings should be sprayed with a fungicide for the control of blue mould, and such treatment will also protect the plants from frog eye infection.

Tobacco seedlings are particularly difficult to spray efficiently. Consequently special care is necessary in the manner of applying the fungicide, and a good "spreader" should be incorporated in the spray material. These aspects, as well as spray formulæ, are fully discussed under "Tobacco Diseases" in the publication "Tobacco Growing in Queensland."

Tentatively either of the following fungicides are recommended:—

#### Bordeaux Mixture.

| | |
|---|---|
| Bluestone (copper sulphate) .. ... .. | 2 lb. |
| Burnt (quick) lime .. .. .. .. .. | 1 lb. |
| Water .. .. .. .. .. .. .. | 50 gallons |

#### Burgundy Mixture.

| | |
|---|---|
| Bluestone (copper sulphate) .. .. .. | 2 lb. |
| Washing soda (sodium carbonate) .. .. | $2\frac{1}{2}$ lb. |
| Water .. ... .. .. .. .. .. | 50 gallons |

### The Spreader.

The addition of a spreader to a fungicide greatly increases its effectiveness, and should always be used when spraying tobacco seedlings.

Either molasses or soft soap may be used at a 1 per cent. strength—e.g., 1 lb. in 10 gallons of spray mixture. The soap should be a genuine potash soft soap in order to obtain best results.

A small portion of the original volume of water should be saved to dissolve the spreader. After the required amount of soap or molasses has been mixed well into this water, the solution should be pumped back into itself until a good lather is obtained. The spreader is then added to the main bulk of spray and stirred in well so that it is intimately mixed with it.

### When to Plant Out.

The seedlings should be transplated at the earliest opportunity when they are sufficiently developed. The seedling stage is a dangerous period in the tobacco plant's career, and the sooner they are planted out the better, provided that conditions are favourable for their removal. If plants are left too long in the seed-bed they tend to become hard and woody and often are infested with nematodes. When planted out they do not make such vigorous growth as robust seedlings would under similar conditions, and consequently are more susceptible to frog eye infection.

### Tobacco Soil.

It has already been stressed that vigorous growing plants are less susceptible to frog eye infection than weak seedlings. Hence it is important that the location and nature of the soil chosen for the cultivation of tobacco be suitable for its normal development. Areas should not be planted unless they have been approved by some person competent to judge tobacco soils.

## Soil Treatment.

The vigour of the plants, and consequently their resistance to frog eye infection, depends largely on cultural practices.

In many districts in North Queensland where tobacco is grown the rainfall is considerable during the growing season, and drainage is frequently necessary. Lack of adequate drainage seriously affects the vigour of tobacco plants.

Shallow soils are not recommended for tobacco growing, but if such soils are used care should be taken that it is not ploughed so deeply as to bring up the subsoil. Cases have been observed where the severity of frog eye has been considerably increased by deep ploughing on shallow soils. If subsoiling is necessary it should not be carried out in the same season in which the tobacco is to be grown. Even on soils of normal depth deep ploughing is not advisable since it is apt to bury deeply what little humus is usually available.

Frequent cultivation is recommended so as to keep the soil in a loose condition in order to encourage steady growth by aerating the soil and conserving moisture. Deep cultivation late in the season, however, should be avoided since roots are damaged in this manner and growth is checked. Cultivation is not desirable after the plants are topped.

Many of Queensland's tobacco soils are very deficient in plant foods. Consequently heavy applications of fertilizers are frequently necessary to encourage normal plant development. Measures should also be taken where necessary, and for the same reason, to maintain or improve the humus content of the soil.

## Priming.

In all countries where frog eye is a serious disease the most effective control measure for this trouble, and indirectly for barn spotting, has been found to be early priming.

In Rhodesia it is recommended that "three or four leaves at the base of the plant should be primed off, carried from the field and *destroyed* as soon as possible after the plants begin to make growth, so that infection is removed before the new leaves appear."

Priming is also recommended in Queensland as a usual cultural practice. It does not involve any financial sacrifice since the leaves removed are usually small and of poor texture, and would be more or less damaged by rubbing on the soil and by cultivation implements. Upon their removal, the nourishment which would have been used by them is made available for other better quality leaves higher up on the plant.

The operation does not consist of removing some spotted leaves from a few individual plants. All plants should be primed and at all times after the plants are established in the field the tips of their lowest leaves should be well above ground level.

By priming, a current of air can circulate beneath the lower leaves of the crop. The plants consequently benefit considerably, conditions are made unfavourable for the development of the fungus which is responsible for frog eye, and spotted leaves which are primary sources of infection are removed.

Priming should be regarded as a preventive measure and not one to be adopted only after the advent of the disease. It is most important, furthermore, to prime the plants early. The following quotation from a report on tobacco diseases in Florida aptly illustrates this aspect: "In 1922 frog eye was very prevalent in Gadsden County, but in fields where the leaves could be primed early the crop suffered very little damage. On the other hand, in fields where rains delayed priming frog eye caused considerable loss."

It should also be stressed that all primed leaves and any other plant debris should be carried off the field and promptly destroyed.

### Harvesting.

The leaf should be harvested as soon as mature. Tissue which is over-ripe is definitely more susceptible to infection, and consequently if the leaf is permitted to age in the field spotting will be more severe than otherwise. It should be realised, however, that green leaf is worthless, and hence leaf should not be harvested before it is definitely mature when endeavouring to escape the disease in this manner.

### Curing.

Variations in the usual methods of flue curing are practised in some countries with the object of mitigating barn spot development, and it is reported that a certain degree of control has been achieved thereby.

This aspect of the control of barn spot is at present under investigation.

Since these methods, however, usually involve subjecting the leaf to high temperatures prior to colouring, there is a danger of damaging the leaf thereby. Consequently these methods are not at present recommended.

## A POINT IN FARM PLANNING.

It is not always possible to lay out the farm on lines which will last for all time, but if a definite plan is made in the first place, it will usually be found that any subsequent alterations will be of only a minor character.

In regard to the grouping of the buildings, it is important that they be not clustered closely together, if only on account of risk of fire. Some buildings, such as the farm smithy, are a source of great risk, and if located against other buildings will lead to heavy insurance charges. The risk of loss in any case is greater when all the buildings are close to each other.

The direction of prevailing winds should be taken into account. The most dangerous winds are westerlies. Buildings, haystacks, &c., should, therefore, be located in such a way that, should one catch fire, the risk to others will be minimised. The arrangements should also be such that there will be no difficulty in making firebreaks by ploughing, planting of green trees, &c.

In arranging the buildings, attention must be given to convenient working. The haysheds, for instance, should be reasonably close to the stables. Needless to say, good drainage should be assured.—A. and P. Notes, N.S.W. Dept. Agric.

# NEW DIRECTOR OF AGRICULTURE.

## Mr. GIBSON'S CAREER.

The new Director of Agriculture, Mr. A. E. Gibson, was born in Victoria and educated at Dookie Agricultural College, graduating therefrom in February, 1890. He was awarded the principal agricultural prizes for that year.

After leaving Dookie College he was engaged in butter manufacturing under the Victorian Butter Bounty Scheme, and assisted in the making of the first 100 tons of butter exported to England under that scheme. A term of dairy farm management was followed by the management of a Western district sheep property for a period of four years. Later he farmed on his own account in the Maffra district, North Gippsland, where he was engaged in fruitgrowing, dairying, and general farming, and introduced to that district the practice of conserving fodder as stack silage.

PLATE 117.—MR. A. E. GIBSON.
Director of Agriculture.

Seven years afterwards he left for Queensland and joined his brother, a surveyor in the Survey Department, in field work for the purpose of obtaining first-hand information and experience in the soils, grasses, and timbers of this State; knowledge which has been a great benefit to him in connection with his agricultural work. In July, 1911, he accepted an appointment in the Department of Agriculture and Stock as Farm Foreman at Gatton Agricultural College under the late John Mahon, and continued in that capacity under Mr. H. C. Quodling, now General Manager of the Queensland Agricultural Bank, sometime Acting Principal of the College.

Mr. John Brown was appointed Principal, and during his régime Mr. Gibson was responsible for the conduct of the farm operations, including all experimental work.

He was transferred to the head office early in 1915 as Agricultural Instructor under Mr. Quodling, who was subsequently appointed Director of Agriculture.

Eventually he was appointed Senior Instructor in Agriculture at Brisbane, coincidental with the similar appointments of Mr. G. B. Brooks and Mr. N. A. R. Pollock, who were stationed in the Rockhampton and Townsville districts respectively.

In June, 1930, Mr. Gibson was appointed Government Representative, as deputy for the Director of Marketing, on the Wheat, Barley, Peanut, Arrowroot, Broom Millet, Honey, and Canary Seed Boards. During Mr. Rumball's absence in England he also acted as Government Representative on the Egg Board. In addition, he was the Government Representative on the Executive of the Council of Agriculture.

Until recently he had been discharging the duties of Acting Director of Agriculture, pending confirmation of his present appointment.

## NEW AGRICULTURAL CHEMIST.

### Mr. GURNEY'S CAREER.

Mr. E. H. Gurney, who has succeeded the late Mr. J. C. Brünnich as Agricultural Chemist, has had a long and notable official career. His first important appointment was as chief Assistant Chemist to Mr. F. B. Guthrie. Agricultural Chemist, Department of Agricultural, Sydney, New South Wales, from 1893-1901. During this period he made investigations of hybrid wheats for the famous wheat breeder, Mr. W. Farrar. In 1901 he joined the staff of the Queensland Agricultural College at Gatton as Science Master, and in 1908 was appointed First Assistant Chemist to the Agricultural Chemist, Mr. J. C. Brünnich, Department of Agriculture and Stock, Brisbane. In addition to his laboratory work, numerous lectures have been delivered, from time to time, by Mr. Gurney to various farmers and fruitgrowers' associations on soils and fertilizers.

In 1929 a series of addresses on animal nutrition were given by him to the pastoralists of the south-western portion of Queensland. On the retirement of Mr. J. C. Brünnich in 1931, Mr. Gurney was placed in charge of the Agricultural Laboratory, which position he held till he was appointed Agricultural Chemist on 19th July of this year. He was president of Royal Society of Queensland in 1917; and is a member of Australian Chemical Institute, of which he is president-elect for Queensland, 1933-34.

Mr. Gurney is a regular contributor to these pages, and his papers on animal nutrition and related subjects have won widespread notice.

PLATE 118.—MR. E. H. GURNEY, A.A.C.I.
Agricultural Chemist, Department of Agriculture and Stock, who has succeeded the late Mr. J. C. Brünnich.

PLATE 119.—GATTON AGRICULTURAL HIGH SCHOOL AND COLLEGE—NEW DORMITORY FOR OFFICERS.

PLATE 120.—GATTON AGRICULTURAL HIGH SCHOOL AND COLLEGE—NEW DORMITORY FOR STUDENTS (IN PROGRESS).

[*Blocks by Courtesy Works Department.*

# THE NOOGOORA BURR (*Xanthium pungens*).

## A WEED POISONOUS TO LIVESTOCK.

By C. T. WHITE, Government Botanist.

AFTER the recent rains there is sure to be a prolific growth of seedlings of the Noogoora Burr. They are poisonous to live stock, particularly pigs, calves, and chickens. The plants are, however, only poisonous when quite young and still bearing the seed leaves. They lose their toxicity when probably a few weeks old.

*Description.*—A robust annual weed up to 6 feet or even more under good conditions. Stems rough to the touch, due to a clothing of coarse scattered hairs. Leaves clothed, both above and below, with short, stiff bristles, lobed, the edges again lobed or toothed, 3-nerved from the base, mostly about 6 inches in diameter on the flowering shoots, but much larger on the lower part of the plant, borne on a long, stout leaf stalk. Male flowers in a few clusters along a slender terminal branchlet, soon dropping off. Female flowers in clusters in the lower part of the slender terminal flower-bearing branchlet, and in clusters in the leaf-axils; persistent and developing into hard, woody, spiny burrs. Burrs when ripe, brown, about 1 inch long, and densely covered with hooked spines; they contain two ''seeds'' (achenes), one of which usually germinates one year, the other the following.

*Distribution.*—A native of North America, supposed to have been introduced into Queensland with cotton seed from that country about seventy years ago.

*Common Name.*—Noogoora Burr is the name in universal use in Queensland and New South Wales. It is derived from the fact that Noogoora Station, Queensland, was the first place in Australia where the plant was observed. The genus *Xanthium* is of wide distribution, but finds its greatest development in North America, where the members are usually known as ''cockleburrs'' or clot burrs.

*Botanical Name.*—*Xanthium* from the Greek *Xanthos,* yellow, one or more of the species yielding a yellow hair dye; *pungens* from the Latin *pungo,* I prick or stab, referring to the prickly burrs.

*Poisonous Properties.*—The Noogoora Burr and other Cockleburrs are now known to be definitely poisonous to stock. The plants, however, are only poisonous in the young stage, soon becoming innocuous.

*Remedies.*—In a valuable publication, ''Stock Poisoning Plants of the Range'' (United States Department of Agriculture Bulletin 1245), C. D. Marsh, speaking of poisoning by *Xanthium* or Cockleburrs, states: ''Experimental work has shown that beneficial results follow the administration of oils and fats. For this purpose linseed oil, bacon grease, or lard can be used.''

*Uses.*—In a booklet on ''Cockleburrs'' (United States Department of Agriculture Circular 109), A. A. Hansen states: ''A method of extracting oil from cockleburr seed has been developed, producing a valuable oil useful for paints and varnishes and as human food.''

*Eradication.*—All efforts to eradicate the burr should be aimed at preventing seed production. The young plants, when growing thickly together, are quickly destroyed by weak arsenical sprays. In the Journal of the Council for Scientific and Industrial Research (volume 3, No. 2), Dr. Jean White-Haney has a comprehensive survey of methods of eradication. Regarding the use of arsenical sprays she states: ''This mode of destruction is employed in densely infested areas. In the great majority of cases investigated, arsenic pentoxide solution of strength of ½ to 1 lb. arsenic pentoxide to 1 gallon of water was sprayed on to the plants. Arsenic pentoxide solution has been reported by all those whom I have heard have used it to be 100 per cent. successful in killing burr plants, those which were sprayed with the more dilute solution being as effectively, though more slowly, destroyed.''

*Botany.*—Until recent years the botany of the genus *Xanthium* was in a somewhat jumbled state. A monograph published by Dr. Felix J. Widder (Fedde's Repertorium Beihefte Band XX.), in 1923 was a valuable contribution to the systematics of these plants; he recognised twenty-five distinct species and several hybrids. The Queensland plant has always been referred in the past to *Xanthium strumarium* L., a name at that time used in a very general way for several Cockleburrs. Dr. Widder states that the true *Xanthium strumarium* is a native of Europe and Western Asia. It is not known to be naturalised in Australia. Dr. Wedder being a correspondent of mine, I sent him several specimens of the Queensland plant, and he has identified it as *Xanthium pungens* Wallr.

PLATE 121.—NOOGOORA BURR.
A Weed Poisonous to Live Stock.

# THE QUEENSLAND NUT (*Macadamia ternifolia*).

By H. BARNES, Acting Director of Fruit Culture.

UNTIL recent years the possibility of commercialising the Queensland Nut, or to give it the name now largely recognised, the Australian Nut, was not considered feasible. Whenever mention was made of this nut, one conjured up a mental picture of a small, very hard-shelled nut which possessed a kernel that was very nice to eat, but which required the exercise of such tremendous energy to break it that it was generally considered too troublesome to bother with.

It was not until expert horticulturists and men fully qualified to express opinions of weight on such matters had drawn attention to the value and excellence of the nut by such statements as "it is the finest nut grown in the world" that we began to realise that we had at our door perhaps the foundation of what it is hoped and anticipated will before too many years have passed be a prosperous industry.

Inquiries revealed that there were many different types of Macadamia nuts, and included among them were some excellent thin-shell varieties, which could be opened with comparative ease. The difficulty, however, that the nuts did not throw true to type in subsequent generations presented itself, and adventitious means of propagation proved to be none too easy. Several propagators in this State have, however, persisted in their efforts to find an easy means of grafting the seedling trees, and considerable headway has since been made. In this work special mention might be made of the success achieved by R. Allsopp, manager of the Queensland Acclimatisation Society's gardens, Lawnton, and W. R. Petrie, on his nursery at Petrie, whilst the writer has been successful in using the method known as grafting by approach. It should, perhaps, be mentioned here that though success has been attained in getting the grafts to "take," there is still a deal of information to be gleaned, such as the effect of the operation on the constitution of the tree before definite recommendations can be made that planters should obtain only worked trees.

It must be admitted that the position at the present time, so far as recommendations as to suitable types to plant, is a difficult one, in view of the fact that the industry is as yet comparatively new and there is not much data available on which to work. For instance, analyses of the nuts of different varieties and other experiments are still inconclusive so far as determining the advantage or greater value of a particular variety over another; so that, for the present, recommendations can only be regarded from the point of view which nuts are of most value in respect of the size of the kernels. A study of the position from this angle alone appears to indicate that thin-shell and large medium shell varieties will probably be most in demand. The thin-shell nuts will probably be used entirely for table purposes, and it is likely also that a proportion of the kernels of the thicker shell types, after they have been cracked, will be used in the same way. The actual cracking of the thick-shell varieties is not likely to present any great difficulty, for a machine has been devised by a Brisbane engineer which will crack with ease a limited number of nuts in a given time. While 100 per cent. of the kernels are not delivered from this machine without blemish, the results are encouraging and the device will doubtless later be improved. The greatest difficulty at the present time is to devise a machine which will separate the kernel from the shell after the latter has been cracked.

## Export Market Prospect.

So far as the export market is concerned (this may be many years ahead, but it is just as well to take the long view) the thick shell is again not likely to present an insurmountable problem, for the nuts can be cracked at home and the kernels packed in vacuum containers for shipment, so that the expense of freight on thick, heavy shells will be avoided.

Definite figures as to the area under Queensland nuts in this State are not at present available, but it is possible the acreage is between 200 and 300, and more growers are planting each year. If all that has been said regarding potential markets overseas is true, then we need not fear that the present area will fill all requirements. The writer personally has been in touch with several buyers requiring several tons a month, and according to reports from America, a big tonnage of good quality nuts can be disposed of in that country at a price returning in the vicinity of 5d. per lb. to the grower. Much has been said and written in the last few years about the financial possibilities of the industry, and some ridiculous claims are reported to have been made by individuals who would like to claim credit for the possession of a spirit of patriotism, but who in reality are imbued solely with the idea of boosting this new industry for the purpose of personal gain. It is for the purpose of bringing before growers and prospective growers, as far as possible, the

actual position of this new industry and other relevant matters, so that they may not be led into accepting any fantastic statement of interested or ill-informed people that this article is written.

**Cultivation of the Nut.**

Regarding the cultivation of the *Macadamia ternifolia*, it is probably quite superfluous to reiterate the fact so often mentioned previously that this tree is indigenous to the coastal districts of this State from the Dawson River south to the border and to the north-eastern portion of New South Wales. So far as is known, it has not been found growing naturally in any other country in the world. Though it is found principally in the heavy jungles (miscalled scrubs) or rain forests of our coastal districts, it is known to grow well in other good, well-drained soils in situations free from frost, and preferably sheltered from heavy winds. Too much stress cannot be laid on the importance of selecting good land and a suitable site for an orchard. Some reputed experts on the subject of Queensland Nuts advocate planting on any poor land. In refutation of this most misleading advice, however, I believe it will be sufficient if I call attention again to the fact that the Queensland Nut is only found growing in the wild state in fertile jungle soils, and it naturally follows that domesticated trees must produce the best results on similarly fertile soils.

It has been mentioned previously that there are many varieties, and that at the present time the actual value of any variety must be gauged chiefly by the size of the kernel. Varieties have not been specially classified, but are sold under the name of thin shell, medium shell, large medium shell, or thick shell.

**Planting.**

Seed nuts may be planted in early spring in seed-beds and covered with about 2 inches of soil. The bed should be kept constantly damp, and it is a good plan to cover it with a mulch of well-rotted stable manure, straw, &c. It has been found in practice that only about 60 per cent. of the nuts germinate, the time taken for the young plants to appear above ground varying from one to three months, according to the thickness of the shell. Soaking the nuts in water for two or three days prior to planting has been found to promote early germination. The plants should not be transplanted from the seed-bed until the following winter, the months of July and August being regarded as most suitable. In lifting the plants from the seed-bed for setting out in their permanent positions, it will be found that if the plants are 12 inches high above ground, the taproot will be about 24 inches long below the surface. Their removal may be facilitated by giving the bed a thorough soaking a few hours prior to lifting the plants, and then digging a narrow trench about 18 inches to 2 feet deep along the side of the bed a few inches from it. With the aid of a digging fork inserted at the back of the plants they can then be gently eased into the trench and lifted without excessive injury to the fibrous lateral roots or leaving behind a large portion of the tap root. Keep the roots moist at all times, either by placing them in a bucket of water or wrapping in a wet bag. It is extremely important that the roots should not be exposed to the sun or dry air any longer than is necessary. When transplanting, the holes should be dug about 2 feet in diameter. Fine top soil should be placed round the roots which should be spread out evenly in a downward direction at an angle of about 45 deg. When the hole has been three parts filled with soil, tramp it firmly round the plants and apply a gallon or so of water. The leaf area of the plants should be reduced by about two-thirds to reduce evaporation. This can be accomplished by entirely removing the lower leaves which are usually bunched together and cutting off about half of each of the remaining leaves.

Seed may be planted out in the positions the trees are to occupy permanently; but this method entails a lot of extra work watering if the weather is inclined to be dry.

The distance allowed between plants can be varied somewhat, but 25 feet is regarded as a good all-round distance. This distance allows of seventy trees being planted to the acre. The average age at which the trees become reasonably productive is seven to eight years, though light crops are frequently borne at four years from putting out the young trees. Maximum production is reached in about twelve to fifteen years, when the return under natural conditions is computed at 50 to 100 lb. of nuts per tree.

Though the trees respond well to cultivation, once they become established it is not essential that this should be intense, as the suppression of weed growth in the vicinity of the plants will suffice. Experience to date has shown that a light pruning of crowded branches periodically will at least improve the size of the nuts.

The general method of raising plants has been set out above, but it is questionable whether the trouble involved by each grower raising his own plants and the twelve months' wait before they are transplanted is warranted, for it is possible to procure one-year-old plants from a number of reliable nurseries at a very reasonable price.

During the summer following planting, it is advisable to shade the trees during the hottest months. It has been observed that the provision of shelter from the hot sun at this period is of great benefit to the trees, and is often the means of preventing them being burnt off at ground level.

**Nuts and Bananas.**

Many growers who have planted Queensland Nuts have interplanted them amongst bananas, and this practice is generally recommended. In such circumstances the cost of cultivation of the trees is practically nil, because they are automatically worked when the weeds in the bananas are being chipped and the grower also has the advantage that when the bananas are worked out the nut trees are well established and able to take care of themselves. The trees do not materially interfere with the growth of the bananas, as the latter are shallow-rooted plants, whereas the roots of the nut trees tend to go well down.

Maturity of the nuts is indicated by the outer covering or husk splitting up the side. Nuts should not be harvested prior to this development, for if they are picked green the kernels are distasteful and rapidly deteriorate.

An association, known as the Australian Nut Association, has been formed with the primary object of fostering Macadamia nut growing, and many growers have enrolled as members. The association has done much good work in the investigation of various matters pertaining to the industry. Growers are advised to offer their full co-operation to the organisation, the hon. secretary of which is Miss A. Steven, 22 O'Connell street, West End, South Brisbane.

**Experimental Work.**

The Department of Agriculture has undertaken a number of experiments in connection with the Macadamia. The prospects of producing saleable crops in districts away from the coast are being tested in an experiment plot in the Stanthorpe district. Some trees are growing in and around Toowoomba, but the nuts produced are almost invariably small, or very thick shelled with a small kernel. As, however, there is no record of the origin of the trees, it is not possible to arrive at definite conclusions.

At Buderim another plot has been established, in which several varieties have been planted, and results are being watched.

At St. Lucia Boys' Farm School an acre of land has been planted with nut trees and a further acre is being prepared. Here experiments covering a number of aspects have been commenced, and others are being instituted.

The Agricultural Chemist has carried out a number of analyses of different varieties of the Macadamia, and would be pleased to test and report on samples of any new varieties sent in by growers.

## DO WE KEEP PACE WITH NEW DISCOVERIES?

Admitting the necessity for pressing on with the work of agricultural research, it is very obvious that the accumulation of knowledge is proceeding far faster than its conversion into every-day farm practice. This "lag" in farming practice varies, of course, with the community and the individual, but according to an American writer research is frequently from ten to thirty years ahead of the farmer.

It is inevitable that in this sense the farmer should be in some degree "behind the times," though not many, it is to be hoped, are behind to the extent mentioned. Knowledge necessarily takes some time to percolate to the point of its application; nor can one entirely blame the farmer whose instinct it is to change to a new method only when extended trials have proved its worth. Sheer conservatism, on the other hand, is losing many farmers a substantial amount of money annually. It is a doubtful distinction, after all, and by no means profitable, to be among the "die-hards" in this respect.—A. and P. Notes, N.S.W. Dept. Agric.

# THE PECAN NUT.

By H. BARNES, Acting Director of Fruit Culture.

THE pecan nut is closely allied to the walnut—in fact, it belongs to the same natural order (Juglandacea). It is one of the hickories, and the generally accepted botanical name is *Hicoria pecan.* It grows wild in various parts of the United States and in the territories around the Gulf of Mexico. Its cultivation in Queensland is being gradually extended, and its possibilities as a profitable tree are well worth considering. It is one of the most important nuts grown in America, and the yield about equals that of the walnut. It is excellent in quality and delicacy.

The pecan tree can be grown in this State over a wide range of localities and is not subject to injury by frost. It is found growing in various parts. Many years ago, Mr. Pentecost, of Toowoomba, planted a number of trees. A few also are found in the Maryborough district, whilst in the last few years a number of new areas have been planted up in various districts. The Acclimatisation Society of Queensland some years ago introduced a number of proved and tested varieties, which have shown promising results in their gardens at Lawnton. This Department also introduced several varieties at one time, but by far the best results to date have been obtained by Mr. E. Collins under the very equable and natural conditions of Redland Bay.

Mr. W. R. Petrie, of Petrie, has a number of fine three to four-year-old worked trees, and, in addition, has also a nursery of young trees.

The tree is also grown in various parts of the Union of South Africa, where it is looked upon as highly profitable.

## Propagation.

The propagation of this tree from the seed is not difficult, and is similar to that of the walnut, except that as soon as the nuts are ripe those required for seed should be stratified in beds of slightly moist sand mixed with a little wood-ash; should they become very dry, it is advisable to soak them four or five days in water before placing them in beds to germinate. Dr. Morris, in his book on "Nut Growing," states that better results are obtained if the nuts are not entirely covered by soil, but are partly exposed to the influences of the weather, remembering, of course, that the soil is to be kept moist. A further method of assisting germination which recommends itself is to mulch the soil in which the nuts have been planted with animal manure, straw, &c., which should be dampened occasionally. This will keep the soil moist underneath, and periodical inspection will reveal when the embryo plants are ready to shift. As soon as the nuts start to show life by splitting they are planted out in nursery rows, about 3 to 4 feet apart and a foot apart in the lines. The ground should be well worked, and must be naturally fertile or made so by the addition of manure, well rotted, and worked into the soil. The rows in which the nuts stand are usually sunk to a depth of 2 to 3 inches, and, after setting out the embryo plants, around which the soil must be well pressed, a layer of ash or weak stable manure is spread in the hollowed-out rows.

When the seedling is about a foot above the ground the tap root, which is enormous, will be found to be from 2½ to 3 feet long; during the winter, when the tree is dormant, this root may be severed at about 1½ feet below the surface, and the tree allowed to remain in the ground for another year and then planted out in the orchards about 30 feet apart. Grown under favourable conditions the tree attains enormous dimensions, and specimens in existence in America are 9 feet in diameter and 100 to 170 feet high. Although a few nuts are borne after four or five years of growth, anything like a crop is not expected till the tree reaches the age of from eight to twelve years, when the yield may reach anything from one to three bushels of nuts, increasing, as the tree gets older, up to, say, twenty bushels. The pecan, like the walnut, is very long-lived, and in deep fertile soil will grow and bear for a century or so.

## Soil.

It thrives best in deep fertile sandy or clayey loams, bottom lands near river-beds and on alluvial deposits. But although it favours this type of country, it has a fairly wide range of adaptability, and many of our old worn-out banana plantations on the sides of hills and mountains could be quite profitably planted up and made

to continue their sphere of usefulness instead of being allowed to remain idle. Though partial to fairly moist conditions, the soil must be well drained and the water-content always kept on the move. The tap root has the reputation of seeking water at great depths.

### Planting.

In planting out, root development will be very greatly assisted by breaking up the subsoil with the aid of explosives. The use of a $\frac{3}{4}$-inch or 1-inch plug of gelignite at a depth of 2 feet 6 inches to 3 feet is recommended in the average soil. A hole is made in the ground at the site of the proposed tree with a soil auger when the soil is "dry," or if an auger is not available the hole may be jumped with a bar. The charge, with fuse and cap attached, is then lowered into the hole and the soil filled in, no tamping being required. The shattering effect of an inch plug is 7 feet laterally by 18 inches to 2 feet down. When putting in the trees the best soil should be placed in contact with the roots and well stamped throughout, except a few inches of the uppermost layer. Care must be taken that the trees are not planted too shallow. The nursery mark may even be a little below the general surface of the ground.

### Grafting and Budding.

As with most other trees, the product of seedlings, however carefully selected, is variable, so that working-over of proved varieties is resorted to. Great difficulty was at first experienced in obtaining good results, but this difficulty has now been practically overcome, and with a little extra care good results are obtainable. Budwood should be taken from the previous year's growth, and H or side H method gives good results.

### Grafting.

Various kinds of grafts are used, one of the most successful and popular being the "rind or bark" graft. The "whip tongue" is also largely used in top-grafting old trees, but the "strap" graft gives better results. Mr. Allsop, of the Acclimatisation Society's gardens at Lawnton, has experimented with the "slot" graft, as described by Dr. Morris in his book on "Nut Growing," and has obtained good results. The one important point is that both buds and scions for grafting are taken from wood of the previous season. A terminal bud—that is, the fruiting bud—should not be used as a scion, as, from the habit of the tree's growth, the bud immediately before the terminal takes up and continues the main vertical growth of the tree and becomes a leader for the time being.

### Stocks.

The stocks on which to work selected pecans are varieties of hickories or seedling pecans. The affinity of pecans with many of the hickories is good, and the range of adaptability to various soils may be somewhat greater than that of the pecan seedling itself, although, taking all things into consideration, pecans or pecan seedlings are probably better than those on hickories.

Up to about fifty nuts to the pound is considered a fair-sized sample of pecans, although as few as twenty-five to the pound of some varieties may be selected. The tree is monoescious, as is the walnut, in its flowering habit—that is, the staminate and pistilate blossoms are borne separately upon the same tree. The staminate blossoms appear in clusters of catkins upon the last season's growth, somewhat in advance of the pistilate blossoms, which are found only at the terminals of the new branches.

The tree may be expected to thrive in most of the regions adapted to the culture of ordinary tree fruits of the temperate zones. As a rule, if left to grow at will, it does not stand up well against winds; no doubt pruning to give better scaffolding and greater stability to a certain extent will modify this defect.

Owing to the trees being planted at so great a distance apart, cultures of different sorts are carried on between them during the early period of the orchard's development.

# THE PAPAW OR PAPAYA (*Carica Papaya*).

By H. BARNES, Acting Director of Fruit Culture.

THE native home of the papaw is recorded as being tropical America, although the actual part to which it is indigenous is not definitely known. The plant is easily propagated from seed, and this fact has aided its rapid dissemination throughout the tropical and, to some extent, subtropical, countries of the world. There appears to be no record of how and when it was introduced into Queensland, but it is now grown in all our coastal districts in frost-free situations. It is probably one of the most susceptible of tropical plants to frost injury, and should always be planted above this level.

## The Plant, its Habit, and its Fruit.

The papaw is a giant herbaceous plant rather than a tree, attaining a height of 12 to 20 feet, and according to its natural habit develops only one stem, with no lateral branches, and surmounted by a turf of large palmate leaves borne on the end of long petioles. Its likeness to the palm has often been remarked upon. The height of the fruit from the ground, after the plant has made about three years' growth, often results in the fruit being bruised and damaged when it is being picked. This difficulty can be overcome largely by pinching out the terminal growth of the young plant when it is 2 to 3 feet high. This will cause the single stem to divide into several secondary stems, all of which will bear fruit, and which naturally will not grow so tall as in the case where the plant is allowed to grow with a single stem.

Normally, the plant is of dioecious habit with staminate and pistillate (male and female) flowers produced on different plants. The flowers are produced in the uppermost axils of the leaves, and in the case of the male tree the flowers are white and are borne on the end of long pendant racemes 2 to 3 feet in length. These flowers are sometimes of a hermaphrodite nature, and it is on this account that they are at times followed by small elongated fruit of no value. The flowers of the female tree are more yellow in colour, are larger, of a bell shape, and are subsessile.

The fruit of the papaw varies in shape according to variety from spherical to cylindrical, and when mature is of a bright yellow colour. The flavour varies somewhat in different varieties, and is also influenced by the conditions under which it is produced. Generally, however, it may be described as sweet, though at times insipid, and to some demands an acquired taste. It can, though, often be made more palatable by the addition of sugar, lemon, or orange juice, or wine. The fruit makes a splendid ingredient in the preparation of fruit salads, and is also made into excellent sauces, jams, chutneys, &c., whilst when green, after being allowed to soak to remove the milky juice and then boiled, is quite equal to vegetable marrow. Many claims are made for the wonderful medicinal qualities of the papaw. It is credited with possessing remarkable digestion promoting properties, as also are the seeds, which resemble watercress in flavour. An active principle known as Papain, which greatly resembles Pepsin in its digestive action, and is sometimes used as a substitute for the latter, is present in the milky sap of the fruit and in all parts of the plant.

## Varieties.

In recent years much attention has been directed to the evolution of perfect bisexual or hermaphrodite types in an endeavour to dispense with the necessity for male trees in an orchard for the purpose of cross pollination. The late Director of Fruit Culture (Mr. G. Williams) stated in an article in the "Queensland Agricultural Journal" for December, 1931, that two bisexual varieties, the New Guinea or "Long Tom" and the Cowleyii or "New Era" introduced into the North some years ago were worthy of mention, but that the typical features had by cross-fertilization been almost eliminated. The truth that is contained in this statement is evident from a study of the fruit arriving at the markets from different districts. Modifications of these two original varieties are the most largely grown in Queensland at the present time, though the Cowleyii probably takes preference over the New Guinea type.

## Planting.

It is wise for intending planters to select their own seed from large, well-formed fruit which have been allowed to thoroughly mature on the tree. The seed should be well washed in fresh water and then dried in the shade. Early spring is the best

time for sowing the seed, and the use of specially prepared seed-beds subjected to partial shade is the recommended practice. If the beds are kept well watered the young plants will appear in a short time, and when about 8 to 12 inches high may be transplanted to their permanent positions. When planting out, the foliage except the young undeveloped crowns should be removed to reduce evaporation from the plants. Here a note of caution may be sounded. If at any time during the life of the papaw plant it is necessary to remove foliage, only the leaf blade should be cut away, allowing the petiole or leaf stalk to remain on the stem. If the petiole is removed whilst green an entrance to the stem of the plant is allowed for various rot-producing fungi, whereas if it is left on the plant the latter has a chance to protect itself by the deposition of a layer of corky bark at the junction of the petiole and stem, and no open wound is left through which disease can gain an entrance.

Where young plants are grown under shade, this should be removed several days prior to transplanting, and watering should be discontinued to allow the plants to harden off, so that they will be able to get a better start when planted out. A few hours prior to digging up the plants give the bed a good soaking, so that the plants may be easily lifted without excessive injury to the roots. The plants should be taken up with a ball of earth adhering to the roots and planted in their permanent positions at about the same depth as they were growing in the seed-beds. Firm the soil well about them and water thoroughly.

In any lot of seedling plants there is always present the possibility of numerous male plants, which, as has been intimated, are unproductive. Though many methods have been advanced from time to time as guides to enable male plants to be distinguished from female plants in the seed-bed, none unfortunately have yet been put forward which can be recommended as infallible. It is, however, frequently the case that in the seed-bed a wide variation of vigour in individuals is noticeable. In practice it has been found that the stronger plants are almost invariably males; so that by weeding out these plants and leaving only the weaker specimens there is a reasonable chance of obtaining a big percentage of females. It is not suggested that by following this practice 100 per cent. females will be secured, and as a further precaution it is recommended that in planting out, two or even three plants be planted 2 or 3 inches apart in the one hole and allowed to grow. When the flowers appear the males and unnecessary females can be removed and one female plant left in each hole. About 8 feet by 8 feet is regarded as a reasonable distance apart for planting, as this enables horse cultivation to be carried on between the rows.

### Soils.

Whilst the papaw is not essentially a deep-rooted plant, and, provided drainage is good, will grow well on soils which are comparatively not of great depth, it is a fairly heavy feeder, and is therefore partial to a fertile soil. If the soil is not over well supplied with plant foods, the deficiency may be made up by the addition of stable manure where available and the application of artificial manures. The Agricultural Chemist recommends the following fertilizers per acre:—1 cwt. nitrate of soda; 2 cwt. bonedust or Nauru phosphate; 1 cwt. superphosphate; 1 cwt. sulphate of potash—or 1 to 2 lb. of this mixture per tree.

### Marketing

The nature of the papaw renders it a comparatively difficult fruit to market successfully without bruising where it has to be transported over long distances; consequently the first requirement is that it be given every protection when packing, at the same time keeping in view the appearance it will present when exposed for sale.

The Instructor in Fruit Packing states that before being packed the fruit should be cooled and sized. To assist in making the operation of packing easier, it is a great help to endeavour to match the various shaped papaws whilst sizing them into heaps. Four sizes should be sufficient to cover the packing of papaws for export. Sizing is easily done on a flat-topped table covered with soft bags or other suitable material. Many growers do not think it necessary to go to this trouble, failing to appreciate that the skin of the papaw is exceptionally tender, and that the slightest scratch will cause the fruit to bleed, thus damaging the appearance of the fruit.

### Packing.

The best container for long-distance carriage of papaws is the tropical fruit case, 24¾ inches long by 12 inches wide by 12 inches deep, as used for bananas and pineapples. Woodwool is the most satisfactory packing. The box is prepared by

placing a layer of woodwool on the bottom of the case and around the ends and the sides. Each papaw is then wrapped in soft paper and placed in a single layer in the prepared box, using small pads of woodwool to make individual fruit firm and snug. A thin layer of woodwool is then placed over the top of the fruit, and the process is repeated until the case is full, finishing off with a layer of woodwool packing on the top. It is unwise to have the fruit projecting too far above the top of the box, but the lid of the case should press just firmly enough to keep the fruit snug and firm. Packers should avoid placing too much padding in the case. Care in matching the various shaped fruit will greatly assist in this. By using a coloured wrapper in conjunction with the woodwool a very attractive package can be placed on the market. Care in eliminating all green, over-ripe, or diseased fruit when packing is absolutely necessary to ensure safe transit and satisfaction to buyers.

**Packing for Local Markets.**

Growers who are near enough to their markets to be able to use motor transport have a decided advantage over those who have to send over long distances. The fruit can be left on the tree to become almost fully ripe before sending to market, and it is not necessary to pack in the same manner as when sending farther afield. Close attention should be paid to the elimination of all disease-infested or marked fruit, and sizing should also be rigidly adhered to. The Australian dump case, made in the form of a tray 18 inches long by 14¼ inches wide by 8⅝ inches deep, is a good container for the local market. The fruit is packed on end in a single layer resting on a layer of woodwool or similar packing. As a protection against rubbing the bottom end of each fruit, it should be wrapped for about two-thirds of the way up in clean white or coloured paper, while each fruit is made snug and tight by pushing pads of woodwool in between each fruit. Papaws packed in this way have a very attractive display value, and sell much more readily than those carelessly placed in cases without packing, the buyer being able to appreciate the quantity and quality at a glance.

## SEED MAIZE FOR SALE.

**Maizegrowers are informed that the Department now has available for distribution an additional stock of selected stud seed maize of the Improved Yellow Dent variety, price 9s. per bushel, railage paid to the purchaser's nearest railway station. Supplies of all other varieties are exhausted.**

**Improved Yellow Dent.—A tall-growing, late-maturing variety, five to five and a-half months. The ears are cylindrical in shape, carrying sixteen to eighteen tightly packed rows. The grain is deep, wedge-shaped, of rich amber colour, with a yellow tip cap and rough, coarse dent. It is suitable for coastal districts and scrub lands where there is a good rainfall. It is capable of giving heavy yields of grain and fodder. Special strains of this seed have yielded over one hundred bushels per acre under field conditions.**

**As supplies are limited, the quantity available for any one applicant is restricted to not more than three bushels. All orders must be accompanied with remittance. Cheques with exchange added should be made payable to the Under Secretary, Department of Agriculture and Stock, Brisbane.**

# AGRICULTURAL NOTES.

By H. S. HUNTER, Agricultural Branch.

## CROP PROSPECTS.

UNUSUALLY favourable seasonal conditions have been experienced throughout the early spring months, the rainfall has been well distributed over the period, and thereby providing the maximum benefit from the total registration. With the coming of warmer weather in the month of October growth of vegetation has been stimulated; spring-sown crops are making good headway, and the improved pastures are reflected in better yields from dairy herds.

### Wheat.

Although wheat-sowing was a little later than usual, the crops have made good progress, and the early October rains have practically ensured a good yield, if not a record. [It is now estimated that the wheat yield will be 6,000,000 bushels—Ed.] The highest yield in the State was obtained in the 1930 season, when 5,107,161 bushels were harvested from 272,316 acres. It is estimated that the current season's acreage is considerably in excess of the area sown in 1930; and it now remains for the crops to escape damage from rust and hail, or heavy rain at harvest time. Rust has made an appearance in some of the fields, but at the time of writing weather conditions are such as to check its spread. The two minor wheat-growing areas—the Maranoa and the Dawson Valley—are experiencing the best season for many years. In the Maranoa the crops are now ripening and harvesting is near at hand.

Contrary to earlier anticipations, it now seems possible that all of the Australian States will experience a normal wheat season, and consequently the agreement to restrict exports may create a carry-over. The average quantity exported over the past three seasons was 150,000,000 bushels, and it is now learned that Australia has agreed to export not more than 105,000,000 bushels up to the end of July next, which means a reduction of 30 per cent. instead of 15 per cent. as at first stated.

As the result of the possibility of an unmarketable surplus in Australia, and the fact that world prices have fallen to low levels since the United States has commenced to subsidise the export of its surplus wheat to the East, the market prospects for the coming harvest are somewhat obscure.

There is a considerable increase in the area planted with canary seed this year, and the resultant harvest should provide a surplus, sufficient to create a safety margin to ensure of Queensland's supplying the requirements of the Commonwealth during the following season.

### Maize and Dairy Fodders.

Extensive areas have been planted with maize and summer-growing dairy fodders, and the crops generally are making good headway. It is seldom that good supplies of artificial fodder can be secured in the early part of the season and with the normal summer planting yet to take place, from which the bulk of fodder is usually obtained, an excellent opportunity presents itself to conserve the early harvest for use next winter.

### Potatoes and Onions.

The recent rains have caused a considerable amount of blight in potato tubers, and as imports from Southern States have practically ceased, prices have improved on the local market.

Early season's onions are commencing to come forward, but in some instances the quality has suffered, owing to the bulbs having been lifted from the soil too soon.

### Cotton.

This season will witness a record sowing of cotton, with conditions at planting time most favourable for securing a good stand. In the Callide Valley, where the soil has received a thorough saturation, weeds are causing trouble, and at this stage the growers desire fine weather to enable them to cope with foreign growths. A good season would be of incalculable benefit to the growers in the Callide area, for many of them are in straitened circumstances from the effects of a series of crop failures. A further payment is to be made to cotton growers for the 1933 season's cotton at the rate of ½d. per lb. on all seed cotton received since 31st May, plus ¼d. per lb. on all seed cotton received during the course of the season.

**Tobacco.**

Orders for tobacco seed are not so numerous as in past seasons, but this may be attributable to a great extent to the fact that many established growers have saved seed from the previous crop. This practice is not commended in cases where the previous crop was infected with serious disease. Seed originating from disease-free crops is procurable from the Department of Agriculture and Stock, price 4s. per oz. The varieties available are Hickory Pryor, Warne, Yellow Pryor, and Cash. The planting of seed-beds will be in full swing by mid-November and ploughing operations now are well forward for the coming crop. Instances may still be found where old season's plants are permitted to remain in the ground months after harvesting has been completed. By his neglect to uproot and destroy these plants the grower is providing a breeding ground for pests and diseases. Besides, failure to destroy the plants is an offence under the Diseases in Plants Acts.

**Increase in Milk Supply.**

As the season advances, the milk supply is mounting week by week, and the output of dairy products from the factories increasing. Now that Victoria has agreed to fall into line with the other States, an Australian stabilised price for butter should soon be an accomplished fact.

According to the Export Control Board's annual report, butter exports for the year ended 30th June last aggregated 100,546 tons, or 9,460 tons more than the previous year's figures. Cheese exports were 5,411 tons, or an increase of 2,033 tons. The average weekly price received for choicest salted butter was 86s. 6d. per cwt., compared to 104s. 6d. per cwt. during 1931-32.

PLATE 122.—DAVID DERBY.
Champion Trotting Stallion at this year's Brisbane Show; the property of Mr. D. Knox, jr.

# THE DAIRY INDUSTRY.

## SUPPLEMENTARY FODDER CROPS.

(Supplied by the Dairy Branch.)

THE loss of wealth to Queensland through drought and seasonal shortage cannot be accurately estimated, but there is no doubt of its immensity. If supplementary fodder crops were grown and conserved on every dairy farm drought losses would be lessened considerably.

During the spring and summer months the pasture grasses grow rapidly, and if the method of rotational grazing described previously in these notes were adopted generally there would be ample pasturage of high nutritive value in any normal season. There is then little call for supplementary fodder crops, unless the farm is overstocked.

The same thing would apply in winter, if winter-growing grasses were introduced, and provided there was sufficient rain to produce the desired growth. However, it is only within recent years that any attempt has been made to introduce certain winter-growing grasses. During winter months pasture growth is at its lowest by reason of our limited winter rainfall, consequently, a full measure of nutriment cannot be obtained by the cattle from the ordinary pasture grasses.

Most farmers engaged in dairying do not seem to realise the advantages of growing crops to supplement pastures and to tide their stock over the leaner months. Furthermore, fodder crops should and can be grown and conserved in good seasons as a form of drought insurance.

It is the duty of every farmer to prepare for the inevitably recurring dry year.

Of the fodder crops which may be grown in the dairying districts of Queensland, the following have proved to be the most satisfactory during the summer months:—Lucerne, maize, sorghum, including Sudan grass, cow peas, cow cane, pumpkins, Japanese millet, white panicum, and all foxtail millets.

Winter fodders are represented by such crops as rye, barley (preferably skinless), field peas, vetches, wheat, oats, and root crops (represented by mangels and, in some particularly favoured districts, field carrots), while rape and field cabbages have under favourable conditions been produced in certain dairying districts, chiefly in those situated on the coast. In order to supplement the available feed in dry winters some method of fodder conservation is necessary.

### Methods of Conserving Fodder.

The two chief methods of conserving fodder are in the form of silage and hay. While the curing of a fodder as hay entails the drying out of sufficient moisture from the crop to ensure that no injurious fermentation or the production of objectionable moulds shall occur, the curing of a crop as silage demands that the natural moisture or juices of the crop shall be as far as possible retained. The growing of a crop of succulent fodder, and the preservation of it for an extended period in a condition palatable to stock, can be carried out by the farmer of average intelligence without previous experience in silage making, provided that the instructions which are issued by this Department are rigidly adhered to.

### Crops for the Silo.

The crops commonly used for making ensilage are maize, sorghums, including Sudan grass, Japanese millet, white panicum, wheat, oats, barley, and peas. Lucerne when used alone is apt to suffer in the process of ensiling, but is valuable in combination with other fodder of a fibrous nature.

While ensilage may be regarded as a very valuable fodder during dry times, its chief value is in its succulence; and concentrates in some form or other are necessary to replace the proteins which are lost in process of fermentation during ensiling. Carbohydrates are generally increased by the changing of the starches into a more assimilable form. A very common and erroneous idea exists, in that any form of fodder used for ensiling purposes is as good as another. That is not so. Naturally such crops as maize will produce a higher quality of ensilage than that produced from Sudan grass, while a mixture of either wheat, oats, or barley with field peas is superior to that produced from such crops as rye or foxtail millets. Generally speaking, leguminous crops can only be used for silage purposes when used in combination with crops having a higher fibre content.

The cultivation of crops for silage is practically the same as if they are to be used for feeding in the green state. Harvesting is much the same, except that it is preferable to cut and bind the material if machinery is available.

For the average dairy farm, the necessary machinery is too expensive, but much might be done in the way of co-operative ownership of such machinery.

Where the maize binder is not available and the crop is sown in drills the mower may be used for cutting; but mowing is uneconomical, due to the fact that after being cut the stalks require to be bundled for loading. A side delivery mower is to be preferred for such work, if available. Where neither is procurable, hand cutting with a cane knife and placing in bundles for loading is advisable. A sledge fitted with a scythe on one side to operate as a cutter has been found serviceable in handling light maize crops.

### When to Cut for Silage.

The right stage at which to harvest a crop for silage varies with the crop. Maize is harvested when the grain is in the milk stage; sorghum and Sudan grass while the grains are formed, but still in the milk stage; wheat and oats when the grain is in the milk stage, but before any sign of over-maturity of the leaf is in evidence. Sorghum, while not as good as maize for silage purposes, has the advantage of producing a satisfactory crop under soil and climatic conditions that would be unfavourable to maize. Yields of sorghum up to 20 tons to the acre have been obtained in good seasons. It is poisonous in the immature state, and cattle should not be allowed access to it prior to the flowering stage. Maize under good conditions gives just as heavy yields as sorghum, but has the disadvantage that it receives a very serious setback during dry weather with consequent decrease in yields. Sudan grass belongs to the sorghum family, but gives slightly lower yields. Like all other sorghums, it requires to be fed with due caution during its immature growth.

Wheat, oats, and Japanese millet are not as suitable for silage as maize or sorghum, although silage made from these crops is just as nutritious. The yields of these crops are not particularly high, rarely being over 9 tons an acre in their green form.

Successful silage production really consists in the expulsion of the air from the green mixture, and then its exclusion; the more complete the exclusion the more perfect is the silage. In practice exclusion is obtained by pressure—that is, by weighting the green material.

### The Stack Silo.

Stack silos have generally been looked upon as being the simplest and least costly method of ensiling. The chief drawback to the stack method of ensiling is the amount of wastage through exposure to the air. The extent of the loss depends on the method of stacking adopted and the amount of pressure used in weighting the material stacked.

The stack silo is certainly a cheap method of ensiling fodder, for very little preparation is necessary, and it is well suited for cases of emergency, when a crop of maize intended for grain fails owing to dry weather.

The site of the stack should be on a naturally drained piece of ground, and handy for feeding out to the stock, and yet as close to the crop as it is possible to get it.

A pamphlet entitled "Some Notes on Silage" is available from the Department. Clear and concise directions are contained in this pamphlet for the conservation of fodder in the form of silage; while leaflets entitled "Silos and Silage" and "Weighting the Silage Stack, a probable solution of the difficulty," are also available from the same source.

### Trench Silos.

The success of this class of silo depends on situation and the nature of soil in which the trench has been excavated. The best situation is along the top of a ridge, thus permitting the rapid drainage of water away from the trench. Frequently the type of soil met with under these conditions is shallow and stony or gravelly, and if it overlies a good retentive clay so much the better. The heavy basaltic soils met with over a considerable portion of the State are not, under the usual conditions, suited for trench silos. In fact, any soil which during droughty periods drys out and leaves fissures or cracks cannot be recommended.

It has been previously stated that the essential conditions governing the conservation of green material in the form of silage is the expulsion of the air contained in the material; and if air is permitted later on to come in contact with

the fodder, which by fermentation has then been changed into what we term silage, more or less decomposition will take place. Usually after a dry period heavy rains are experienced, and here again risk of damage from seepage through the fissures in the soil is incurred. The admission of water to silage brings about rapid decomposition.

Provided situation and soil are suitable, a trench silo can be effectively excavated with a plough and scoop, and it is preferable to confine the length of a trench to reasonable limits in order to obtain a proper depth. Consideration should be given to the situation that would arise were heavy rains to occur during filling operations, and for this reason alone it is desirable to limit the length of the trench silo. In all trench silos provision for some form of sump to allow drainage to be pumped during filling operations is necessary, but once filling has been completed the vertical shaft from the sump should be filled in with earth and packed tightly to exclude the air.

The sides of the trench should be kept as vertical as possible in order to facilitate the settlement of the green material during fermentation. In filling, lay the fodder in the direction of and not at right angles to the trench. Commence filling at the bottom, driving the wagons into and over the material in the process of filling, as this tends to consolidate the mass. As far as possible lay the fodder evenly, reversing the heads and butts in order to do so, while gradually extending the slope of the ramp. Keep the material well consolidated at the sides during filling operations. Continue filling until the material is at least 4 feet above the level of the sides, and finish with a pronounced camber or arch on top.

Before covering the fodder with the earth taken from the trench, it is advisable to cover with a layer of at least 1 foot in depth of green waste material, preferably a lush growth of grass. This will mat and exclude the soil from contact with the silage. To facilitate the use of the scoop, it will be found to be an advantage if a thin layer of soil is first shovelled over the covering grass. This prevents its displacement in the early part of the scooping operations. Place the earth evenly over the full extent of the trench and aim at maintaining the camber attained during filling operations. Gradually extend the covering of earth until it extends at least 4 or 5 feet above the area of the excavation. As the material sinks, it will be found necessary to replace some of the soil in order to prevent soakage of water into the trench should heavy rains occur shortly after filling.

When emptying start from one end of the trench and work towards the centre, cutting from top to bottom. Cut the silage in narrow benches, using either a broad-bladed hay knife or a well-sharpened socket-handled spade kept particularly for such purpose. To prevent damage by rain when emptying the trench, it will be necessary to provide some sort of water-proof material which can be easily placed in position and removed when required.

**Pit Silo.**

This silo has several features to commend it. It can, for instance, be located in a hayshed and floored over, or it can be out in the open and protected by a roof. It is advisable to raise the silo a few feet over the ground level with a concrete wall, which will increase the capacity and allow for sinkage. A point about the pit silo is that it can be easily filled with chaffed material, the equipment necessary being much less expensive than that required for an overground silo. At the same time, the cost of emptying is more, owing to extra labour being required in the process. The material in the silo should be well trodden down to exclude air, and, as the silage settles, a few minutes each day should be devoted to tramping it down to prevent access of air.

**Overground Silos.**

As the name implies, these silos are constructed above ground, the usual material being concrete. These silos are somewhat costly to build in the first place, but are the most economical over a period of years, the cost of upkeep being practically nil. With reasonable care a farmer would be able to construct his own silo, thus reducing the cost considerably. The Department of Agriculture and Stock has a number of moulds for use in the erection of circular reinforced concrete silos. These moulds are in three sizes—viz., 14 feet, 15 feet, and 17 feet diameter—and are loaned to farmers for silo construction free of charge, on condition that the borrower pays all transport charges on both forward and return journeys between the Department's store in Brisbane and the site where the silo is to be erected. The borrower also is required to deposit a sum of three pounds (£3) as a bond of good faith that the

moulds will be returned in good order and condition, and free from any adhering cement, as soon as possible after the job is completed, when the deposit is returned in full.

Plans and specifications of reinforced concrete silos of different sizes may be had *gratis* from the Department of Agriculture and Stock.

The fodder must be chaffed before being elevated to the silo. An ordinary chaffcutter will do for this purpose, and to which is fitted an elevator or blower. A good type of blower requiring very little power to operate is now obtainable for about £40.

The determination of which is the best system of ensilage depends on the conditions on the farm on which it is to be used, and this is a matter for the judgment of the dairy farmer concerned, who must be guided by the circumstances under which he is working.

## Haymaking.

In this system of conservation, although dried considerably, the fodder retains its food value. Its palatability is increased considerably if it is fed with succulent foods. The nutritive value of hay depends on the nature and quality of material from which it is made, the changes and losses, if any, incidental to the process of curing, and the change occurring after it has been stacked.

The proper time to cut is when the plant possesses the greatest quantity of digestive nutrients, combined with palatability. In crops other than legumes, this is indicated by full flowering. Lucerne should be cut when at least 40 per cent. of flower is present, but before new growth starts from the crowns. Other legumes should be cut when the pods are well set, but not yet mature.

During the curing process, care must be taken not to lose the leaf, as this part of the plant contains the largest percentage of nutrients. To ensure that the leaf is not lost, the fodder should be raked into windrows as soon as the plant has wilted to protect the leaf from the action of sun and wind. The hay should be cocked before the leaves are dried and their property of drawing moisture from the stems destroyed. If this is done correctly a nice green sample of hay will result. During hot weather, lucerne hay should be handled only during the early portion of the day or well on towards evening.

There is less loss if the hay is stored in a hayshed, but as this is not always possible the alternative is to build haystacks. The site for the stacks should be in a position convenient both to the paddock in which the crops are grown and to the place where it is to be fed to the cattle, and on a well-drained site.

As haystacks erected as a standby in time of fodder shortage may not be required for some time, their covering to prevent damage from rain is important. The stacks may be thatched with strong thin-stemmed plants such as Sudan grass, blady grass, or other tall-growing fibrous grasses. The better method, however, is to cover the stack with sheets of corrugated iron fastened to wooden sections, which are then bolted together, forming a rainproof cover. This method is more expensive than thatching, but the long life and ease of handling outweigh this disadvantage.

Only the finer-stemmed fodder crops can be effectively converted into hay. Crops like sorghum and maize are too fibrous, and therefore can only be conserved as silage or stover. Ratoon crops of Sudan grass, however, make a satisfactory class of hay. The crops most suitable for conservation as hay are lucerne, Japanese millet, Hungarian millet, Sudan grass, wheat, oats, barley, and cow peas.

Of these fodders, by far the best is lucerne, as this crop is high in protein content. One stand will last up to seven years, and three to five cuttings a year may be obtained in suitable localities. Contrary to general opinion, this crop will grow successfully on almost any kind of soil, provided it is well drained and not over-acid. However, it prefers a deep alluvial calcareous soil for best results.

Owing to its high protein content the feeding of lucerne alone gives a rather narrow nutritive ratio, and, therefore, the practice of sowing oats with lucerne seed in certain favoured districts may be followed; and it is to be commended, for it gives a well-balanced hay at least for the first two cuttings, or until the oats dies out.

Cowpea hay is also rich in proteins, and is a good standby in cases of shortage of lucerne hay. Sudan grass and the millets mentioned are heavy yielders, and from 2 to 3 tons of hay can be expected. They take much longer in curing than lucerne, owing to their greater succulence. Care must be taken that hay is sufficiently dry before being stacked, otherwise fermentations take place, producing sufficient heat

to set up spontaneous combustion or to a lesser degree char or brown the fodder. Stacking with excess moisture due to dew or rain is also liable to produce spontaneous combustion in a stack.

In addition to ensilage and hay making as methods of provision against seasonal shortage, another method is the cultivation of crops which are more or less frost-resistant and grow well in winter. These crops are planted in middle or late autumn and make fairly fast growth during the winter. The chief crops grown for this purpose are oats, wheat, skinless barley, prairie grass, and canary seed. These crops should be sown no later than April to enable them to sufficiently develop to feed off in the middle of winter, when grass is generally at its poorest stage. Care should be taken to allow these crops to root deeply and stool out before the cattle are allowed to graze on them, otherwise the maximum benefit will not be obtained from the crop

The disadvantage of this method is that the crops grown have a very wide nutritive ratio, and there is considerable wastage, due to the large quantity of carbohydrates consumed over and above the nutritional requirements. This can be overcome by sowing the carbohydrate-rich crops, such as wheat or oats, with some type of legumes, as these are rich in proteins. This would tend to make the fodder a more balanced ration, because when it is grazed off the cattle would obtain approximately equal quantities of both legumes and cereals.

In 1925 the Department of Agriculture and Stock conducted experiments on various Queensland farms in an endeavour to find out if cereals and legumes could be grown together successfully, and very satisfactory results were obtained. As a result, the following mixtures are recommended:—

Wheat, 30 lb., and field peas or black tares, 20 lb.
Barley, 40 lb., and field peas or black tares, 20 lb.
Rye, 30 lb., and field peas or black tares, 20 lb.
Oats, 30 lb., and field peas or black tares, 20 lb.
Canary seed, 8 lb., and field peas or black tares, 10 lb.

The extent to which it is possible to supplement the pastures by growing fodder crops varies with the individual farm, but by following the principles laid down, even in part, the risk of loss from drought or seasonal shortage is considerably minimised.

## THE TRENCH SILO.

MR. Alf. Johnson, of Kinleymore, writing to the Director of Agriculture, gives the following interesting account of his experience with a trench silo:—

Re your inquiry for particulars of trench silo. The soil is a very dry, crumbly, red volcanic, having been ant (white) infested to a depth of a foot or thereabout; it has been devoid of any surface herbage, but had the usual tree growth—that is, second growth, such as sally and bitter bark.

I found on opening it some four weeks ago that the top layer of soil, about a foot, placed on fodder had kept same perfectly dry, although the top of silage to about 9 inches had not cured, and was slightly musty, but from that down to about 3 inches of bottom was better fodder than when it went in, it being a mixture of old corn stalks with cob, fat hen, Bathurst burr, and pumpkin and melon vines, and summer grass, Sudan grass, and a little lucerne. You see by that I mean the good helped to flavour the inferior.

The pit is about 90 feet long by 8 feet wide by an average of 5 feet deep. I drove a 4-horse abreast team on top of it to unload, thereby tramping it down as it came in. I intend to go deeper and about the width of two horses abreast on my next attempt.

Although I just threw it out as one would hay, there was no waste, and my cows now after three weeks feed through August are at their peak in production, being built up to start off with the early spring. I have no hesitation in saying that they are producing 20 to 30 per cent. more than would have been the case if they had no inside or guts. For cheapness and easy handling, the trench or pit silo is even handier than stacks, as there is no high lifting. I still have a third left and have same sealed up.

# SUMMER FODDER CROPS IN CENTRAL QUEENSLAND.

By W. R. STRAUGHAN, Instructor in Agriculture.

MOST of our annual rainfall, commencing with thunderstorms in November, occurs during the summer months, and is scantiest during spring; consequently, if stock condition is to be maintained throughout the year, it will be found necessary to take the fullest advantage of these summer rains by the cultivation of fodder crops during the wet season, and thus assure a sufficiency of feed over the leaner periods.

Feed requirements for dry periods may be provided for by grazing, green feed, ensilage, or hay crops as facilities allow and seasons permit. Fortunately, Central Queensland is particularly well favoured for the production of a great number of crops useful for such a purpose, many of which are already being successfully grown. Their usefulness requires, evidently, only a wider field of acquaintance to promote their universal establishment. The object, therefore, of these brief notes is to make their possibilities better known.

Although this information has been prepared for Central Queensland particularly, it really is applicable to the farming districts of the State as a whole.

## Panicums and Millets.

This group of forage plants are very hardy and quick maturing, providing grazing often within a few weeks of sowing. With Sudan grass they form the bulk of our summer hay crops and make excellent ensilage. Added assets are their adaptability to variations of soil, ability to thrive on shallow and cheaply prepared cultivation, and the fairly ready response of second growth after harvest.

In a programme designed to maintain a continuity of green feed throughout the year, Panicum is best suited to provide the early summer quota, our climate generally providing sufficient moisture during November and occasionally October to germinate the seed and establish the crop.

When sowing for grazing only normal seeding, 10 to 12 lb. per acre, is required, but where planted for hay during the mid-summer such robust growth can generally be expected that a double rating should be applied to ensure a hay free from coarseness.

Of the different varieties Japanese Panicum—a heavy stooling, hardy, rapid grower—is probably the most suited for grazing, followed closely in preference by White Panicum. White Panicum, having a flat and solid stem, provides a good quality dust-free hay or chaff of bright appearance. It has a tendency to coarseness, however, and for this reason growers frequently give preference to Giant Panicum—a round, hollow, but fairly fine-stemmed variety.

Hungarian or Liberty Millet and French Millet also commend themselves for more general cultivation.

## Sudan Grass.

Sudan grass is another valued hay and grazing crop advised for early sowing. In mid-summer, when abundant supplies of pasture are available, it will also be found admirably suited for ensilage.

Requiring a better prepared seed-bed and warmer conditions than Panicum for striking. Sudan, however, once established, will return a greater collective yield from the successive ratoon growths than these crops, four and even five ratoons per season being reasonably possible. It makes a high food valued hay when not too rankly grown and cut at the flowering stage.

Although it is grown so largely for grazing purposes and stock are permitted to graze on it in all stages of its growth, occasional and sometimes serious losses from poisoning do occur. For this reason it should be fed with caution, and on no account should stock be allowed to graze on immature growth which has become stunted through hot, dry weather. Once the crop has reached the flowering stage, it can be fed with safety.

For grazing, sow either broadcast (10 lb. per acre) or in narrow scuffler-wide drills, at the rate of 3 lb. per acre. For hay production a heavier sowing will tend to eliminate coarseness.

## Sorghums.

Sorghums are regarded in two classes—saccharine and non-saccharine or grain types. The saccharine varieties, if planted during February and March, should mature in May and June, before general frost sets in, and once mature will stand

and maintain their feeding qualities through winter until the dry spring months occur. They can then be cut and fed as required, thus furthering the aim for a continuity of green feed at a time when pasturage is scarce. Heaviest yields of this crop will, of course, be made during the wetter months, when the crop should be cultivated for storing as ensilage.

As is generally known, sorghum has one disadvantageous although avoidable feature in that, when indiscriminately fed, it may cause loss of stock by hydrocyanic acid poison; therefore, feeding or grazing should be avoided during the younger stages of growth, or when a crop is recovering from a dry spell. Once mature, or ensiled, however, all risk of such loss is eliminated. An antidote for such poisoning if it should occur is a dose of about 1 pint of molasses, treacle, or even sugar, administered immediately the affects are noticeable, or it may be administered as a precaution previous to feeding.

Of the varieties, saccaline and White African appear to be the most frost resistant. Honey is the heaviest yielder, somewhat coarse, but of excellent succulence and a distinct palatability. Collier in palatability resembles Honey, has a fine stem, and yields exceptionally well. Early Amber is the earliest variety, but once mature the stem is dry and woody.

The grain Sorghums include Feterita, Red Kaffir, Dwarf Cream Kaffir, Egyptian Corn, and others. Their value is exemplified by their ability to produce grain under conditions fatal to maize. Occasional yields exceeding 100 bushels per acre have been recorded. Parrots are particularly partial to the grain and form the main deterring factor to high production. Feterita and the Kaffirs are heavy yielders of grain, early maturing, and of dual utility. They are, however, close seeded and subject to grub attacks. Dwarf Cream Kaffir's value lies in its diminutive growth allowing of its easy harvesting. Egyptian Corn is an open-headed variety, yielding good crops of hard, good-keeping grain, which is easily thrashed. It is quick maturing, but the fine, dry stems are prone to lodge under windy conditions if the grain is not harvested immediately attaining maturity.

**Maize.**

This crop is cultivated mainly during the rainy months for grain. When sowing for ensilage, for which it is unequalled, or green feed, it should be sown at the heavier rate of 10 to 12 lb. per acre in drills approximately 3 feet apart, allowing for the usual inter-row cultivation.

Practically all varieties are suited for these purposes, but the more robust, taller-growing sorts as Improved Yellow Dent are more eminently so.

Where a crop is planted for grain and fails in the objective originally intended for it, this can also be equally well utilised as ensilage. The best cutting stage for ensilage is when the grain becomes glazed, but it may be grazed or cut for green feed at any period of its growth.

**Cowpeas.**

This legume is not extensively grown in our central district for feed, difficulty being experienced in inducing cattle to graze it green, in harvesting, and in converting it into hay. Where other leguminous fodders are not cultivated, however, it should be persisted with, for when wilted stock will eat it readily enough, and it also greatly improves the feeding value of ensilage when mixed with other crops.

Cowpeas may be sown separately or conjointly with other fodders such as maize, sorghums, and Sudan grass, &c.; but, contrary to several opinions, this method does not materially assist harvesting, but greatly improves the general balance of the ration.

The usual rates of seeding are 10 to 12 lb. per acre in drills 3 feet apart or 1 to 1½ bushels broadcasted. When sown with other crops this rating should be from a-half to one-third these quantities, the accompanying crop being correspondingly reduced.

Of the varieties, Black is of a procumbent or trailing habit, but is probably the heaviest yielding. Poona and Clay are erect growing and more easily harvested.

**Peanuts.**

These are another legume, and although grown principally for the nut, is fast becoming recognised as an excellent fodder crop.

For hay, peanuts should be harvested when the pods have formed, but before the plant commences to die down. They will need to be harvested in the usual method by hand and dried, preferably in cocks.

Seeding should be at the usual rate of 20 lb. of kernels per acre in 3-feet drills.

Care should be taken not to over feed stock or pigs with peanuts, the excess of oil deleteriously affecting the resultant product.

**Elephant Grass.**

A drought-resistant fodder of fair food value, providing frequent cuttings or grazing during dry times. The leaf is fairly readily eaten by stock and luxuriantly produced. The stem is woody and valueless, and precaution against its development must be taken. The crop is propagated by cuttings.

**Cow Cane.**

Cow cane is similarly propagated and of a hardy nature. The stem contains a high percentage of sugar and is of a high food value. The large Javanese varieties are most serviceable.

**Sunflowers.**

Sunflowers are cultivated in several countries for ensilage making. In Central Queensland, small areas are mainly grown for seed, the Giant Russian type being preferred. Sow in drills 3 to 4 feet apart and 1 foot between plants.

**Soy Beans.**

Although soy beans grew fairly well under Central Queensland conditions, they did not appear to be appreciated by stock.

In conclusion, it is desired to point out that Lucerne, queen of all fodders, has been, on consideration, omitted from this brief address, time precluding the justice its importance demands.

The advantages of such a crop are too well understood to need stressing, suffice it to add that, given good drainage and an adequate supply of underground water, a stand can be maintained for five to six years by efficient cultivation.

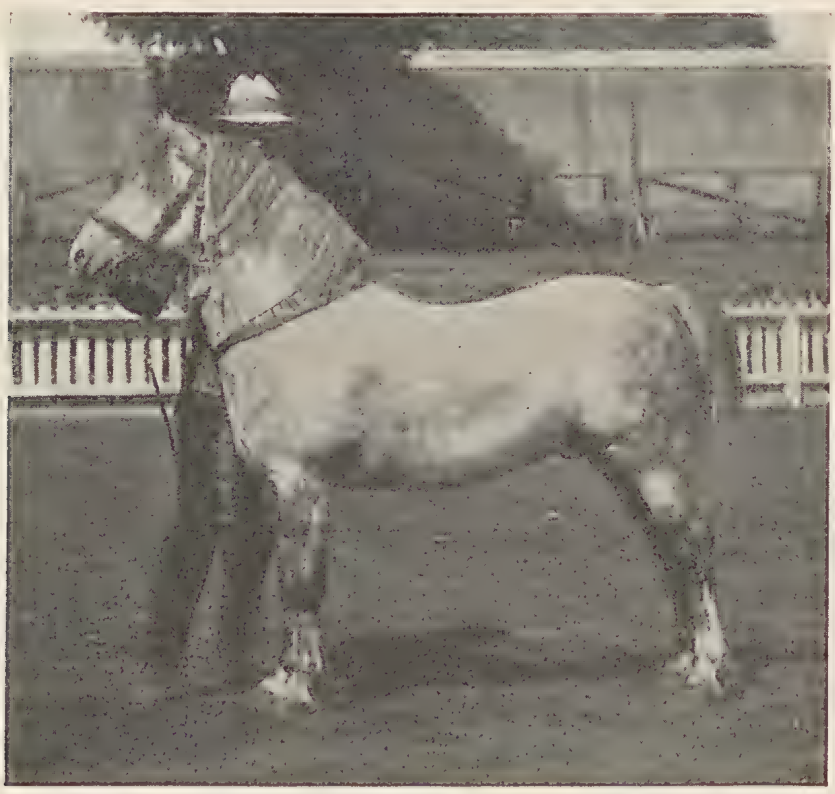

PLATE 123.—FARAAIN MERCURY (imp.).
Champion Pony Stallion at this year's Brisbane Show; the property of Mr. J. M. Newman.

# REDUCING THE CONTAMINATION OF MILK AND CREAM.

By O. St. J. KENT.

ONE of the most important problems a dairyman has to face, from day to day, is the production of milk and cream that will retain a high standard of quality when delivered to a factory or to the consuming public. In the hot summer weather, such as we are now beginning to experience, the problem becomes an acute one, on account of the conditions being just suitable for the quick development in milk of many kinds of microbes.

During the course of its production, milk passes through a long series of utensils each of which adds its quota of microbes, and these little organisms constitute the most serious form of contamination with which we have to deal. Milk is, of course, subject to other forms of contamination as we will see later. It is necessary to know, just where and how these little microbes get into milk, before we can consider means for reducing their numbers. I propose, therefore, to run through each stage of milk and cream production and discuss the contamination that is likely to be encountered.

## Health of Cow.

Let us start first of all with the cow itself. The first essential is that the cow should be free from disease. Unhealthy animals are a menace to the rest of the herd and milk from them will upset the quality of all the milk if mixed with it. The question of disease should not be dallied with, and the services of departmental officers should be availed of at every opportunity.

It may be of interest to dairymen to know that the interior of the udder of even the healthiest cow always contributes a few hundred microbes to every teaspoonful of milk produced. Microbes invade the udder by means of teat canal and may find their way into the milk reservoir. For this reason it is often advisable to reject the first few streams of milk. This rejected milk should be drawn into a separate utensil and should not be squirted on to the floor. This procedure of rejecting the fore milk has the further merit of indicating whether the cow is suffering from any udder trouble, such as mammitis, and so enables the farmer to avoid infection of the remainder of the herd by milking the affected cows last.

## External Contamination.

The contamination of milk from within the udder is negligible compared with that occurring from external sources. Milk and cream are often contaminated as a result of particles of dirt, hairs, and other extraneous material falling from the body of the cow into the milk bucket. The only way to prevent this is to see that the animals come into the milking shed in a clean condition. Much improvement can be effected in this direction by keeping the yards in the immediate vicinity of the milking sheds clean and tidy. In any case, the udder and flangs of the cows should be wiped with a clean damp cloth just before milking, and the application of a little disinfectant solution—such as potassium permanganate—will help to reduce contamination from this source.

## The Milker.

A point that is not often stressed sufficiently is that the milker may be an important factor in contaminating the milk supply. Milking is often looked upon as a dirty job, and one finds some milkers putting on dirty overalls to protect their ordinary working clothes instead of putting on clean overalls or a clean apron to protect the milk from contamination. Clean hands and dry milking are essentials in clean milk production, provided the udder of the cow has been previously cleansed and the teats softened with a little vaseline. The milker should always keep in mind that he is preparing human food, and that by applying the cleanest possible methods he will do much to enhance the favour of this food in the minds of the consuming public.

## The Utensils.

The utensils in and about the milking sheds constitute a very serious source of milk contamination. Experiments have shown over and over again that utensils contribute more microbes to milk than any other source. Buckets, cans, strainers, coolers, and separators all come under the heading of utensils. The use of any of these which are badly cracked, dented, rusted, or in bad state of repair generally, is unwise. Rough surfaces and crevices form excellent hiding places for microbes, and render the vessels difficult to clean and sterilise, so that they are a distinct menace to the quality of your milk and cream.

Rusty utensils may contaminate milk in a different way. The iron in the form of rust is dissolved fairly easily by the acids which exist in milk or cream, and when in solution has been shown to have a serious effect on the quality of butter and cheese manufactured from the milk and cream containing it.

Contamination from utensils can be reduced very considerably by cleaning and scalding or sterilizing them properly. It is not only necessary to clean as much of the milk out of the utensils as possible, but it is of equal importance to see that the vessel becomes thoroughly dry after cleansing. The reason for this is that no matter how thoroughly a cleansing job is done, there will always remain sufficient food to nourish millions of microbes. It is impossible to remove all traces of milk, but it is possible to completely remove all the water which is essential for the growth of microbes. Remember then that complete drying of utensils is just as essential as thorough cleansing.

In washing vessels that have contained milk, it is always advisable that cold or luke warm water should first be used for rinsing before boiling water is added for sterilizing purposes. There is a satisfactory explanation for such advice. Milk contains a substance called albumin, which is very similar to the albumin of the white of an egg. On heating it coagulates just as the white of an egg coagulates. If in cleansing, boiling water is added directly to the milk remnants in the utensils, the albumin becomes coagulated and deposits as a thin film on the interior of the vessel. Such a film grows in thickness from day to day if the same procedure is carried out, and the vessel provides a serious source of contamination. Rinse first with luke warm water and then use plenty of boiling water to which a little soda may be added if necessary, and dry as quickly as possible. The practice of placing utensils out in the open fresh air on a clean rack, away from dust, is a good one. The air circulation will quickly bring about evaporation of traces of water that remain. On no account use cloth for drying the utensils. Buckets and cans should be easy to clean and sterilize provided they are in good order. The simpler the design the better for cleansing and sterilizing.

### Strainers.

Most dairies have a strainer through which the milk is passed before entering the cans. Strainers may be a help to the dairyman provided that they are kept clean, and that the cotton wads or straining cloths are changed frequently. Straining cloths are very dangerous to milk quality if they are not washed, boiled, and dried daily. Cotton wads are safer because they are discarded as soon as they have been used once. The dairy farmer should not over estimate the power of his strainer. It certainly prevents large particles of dirt, hairs, and other substances from entering the can, but it has very little influence on the microbe population of the milk. The size of the microbes is such that they can easily pass through the pores of the straining cloth or cotton wad. If thorough cleanliness were observed throughout there would be little need for straining.

### The Separator.

The separator is often a great source of contamination of cream. Milk that is perfectly good may turn out a bad cream if passed through a dirty separator. The separator should be taken apart each time it is used and the parts washed thoroughly, and quickly dried. I have stressed the drying again, because there is nothing so objectionable as an enclosed vessel containing decomposed milk products.

It seems hard to believe that there are some dairymen who will use separators that have not been cleaned from the previous day's use, yet such cases are from time to time reported. The same man would not, perhaps, think of sitting down to a meal with plates, knives, and forks that have been left unwashed since the last meal. There is no excuse for dirty methods in dairying. Even the poorest of dairymen can afford to cultivate clean habits, and one of the most important of these is to keep the separator clean.

### Milking Machines.

Milking machines are somewhat like separators. They may be either a blessing or a curse according to the fashion in which they are handled. Every milking machine has parts which are difficult to keep in a satisfactory condition, and these must be particularly carefully watched. Among these is the teat-cup assembly, with its metallic and rubber parts. There are essentially two methods of keeping these parts clean—viz., the destruction of microbes by heating them in water and the other by filling them with a solution which prevents the growth of microbes in them.

The heating process simply involves placing the teat-cup assembly, after preliminary cleansing, into a common wash boiler (or similar vessel) provided with a false-perforted bottom. Sufficient water is added to cover them and the temperature is raised to 180 deg. F. for ten minutes. The parts should then be hung up in such a manner that the tubes and teat cups will drain.

A method which has also been found satisfactory is to immerse the parts in a saturated solution of common salt to which is added at regular intervals a small amount of chlorine. A leaflet on the use and care of milking machines is available from the Department of Agriculture and Stock, and should be studied by all dairymen using machines.

So far, general methods of cleanliness with utensils have been stressed, along with the necessity of complete drying after sterilization.

### The Cooling of Milk Products.

The next important weapon we have at our command for reducing contamination of milk products is that of cooling. Too much cannot be said for the benefits to be derived from keeping milk and cream cool. The microbes which give most trouble to dairymen are those which grow best at high temperatures. Gassiness, yeastiness, and bad flavours and aromas in milk and cream, very often come from these products when they have not been cooled. Various types of cooling and aerating apparatus are available to dairymen, but whatever device is used, see to it that it is maintained in a clean condition. The handling of milk on its way to the factory, or during delivery to the public, calls for the greatest attention to cleanliness and cooling devices. It should be protected from the sun by suitable coverings, and should always be stored in the coolest places.

### Contamination from other Sources.

Milk and cream may become contaminated from sources other than microbes. All milk products readily absorb flavours from the surrounding atmosphere, so that occasionally we come across absorbed flavours such as oily, disinfectant, kerosene, and many others. It is generally easy to track these down to their source and prevent them from occurring. Food flavours and weed flavours present a more difficult problem. Feeds which are known to cause very noticeable flavours in milk should be fed as soon after milking as possible, so as to give the undersirable flavour every opportunity of disappearing.

In conclusion, I would like to state very briefly the necessary points for efficient reduction of contamination by microbes:—

(*a*) The animal must be healthy;

(*b*) Strict cleanliness, with sterilization and immediate drying of utensils;

(*c*) Prompt cooling.

Look after these few points and the quality of milk and cream will look after itself.

## THE PLOUGH AND THE COW.

Many dairy farmers erred in their methods of management in that they allowed good cultivation land to grow pasture, said Mr. A. J. Dorsman, of Broke, N.S.W., at the recent annual conference of the Agricultural Bureau of New South Wales. He was convinced that cultivation was essential and that hand feeding, not only in the winter, but all the year round, was worth considering. It was not a difficult matter to estimate the requirements of a herd for any given period and provide for them. Saccaline sorghum gave, say, 8 tons per acre, and lucerne, say, 3 tons—an average of 5½ tons per acre. If each cow received 40 lb. per day (30 lb. greenstuff and 10 lb. dry), which was the ration Mr. Dorsman had fed with success, then with the abovementioned yields 1 acre of cultivation was required to feed one cow for 308 days.

Storage of the fodder was, of course, necessary, continued Mr. Dorsman. The Department had tried to educate farmers in the use of silos and had assisted in their construction. Many man were prevented from erecting silos by the capital outlay, but this was small when considered in relation to the value of the farm and the life of the silo. A silo of 100 tons, a hayshed, an elevator, chaffcutter, and engine could be erected for £400, and would give security against conditions such as those which had obtained in the Hunter Valley for the past eighteen months, and would add value to the farm in addition to the value of the capital outlay.

# FAT LAMBS.

By J. L. HODGE, Instructor in Sheep and Wool.

THAT Queensland fails to produce her quota of fat lambs in proportion to her sister States is a fact, and nevertheless to be regretted. Geographically, climatically, and pastorally there is no reason for it. That we can produce lambs equal to the Southern States is undoubted. The top pens at our recent Royal National Show were fit to compete anywhere. One reason given for the neglect of this branch of the sheep industry is the pronounced rise in merino wool values six or seven years ago. Many farmers growing fat lambs foolishly disposed of their crossbred ewes and went in for merino wool production. We have in this State large areas of land eminently suited to the business, if it is undertaken in conjunction with cultivation. I do not recommend anyone to start fat lamb production on natural grasses only. Any success achieved under these circumstances is in the nature of a fluke, and over a period of years disappointment must follow.

## The Fat Lamb Follows the Plough.

A good slogan for this branch of the sheep industry would be "The fat lamb follows the plough." The wheat farmer should certainly seize the opportunity offering in fat lambs to add to his returns, and, at the same time, save himself no small amount in cultivation costs. Wheat is a splendid sheep fodder, likewise barley and oats.

Lucerne, than which there is no better sheep feed, should not be neglected. The plant will do well on any well-drained flat where there is sufficient rainfall and the frosts are not too severe. Artificial grasses deserve every consideration by way of pasture improvement, and this is especially so in the case of a winter grass. *Philaris tuberosa* (a species of Canary grass) could be sown in the autumn and with a successful strike make an excellent winter grass.

## The Lamb Required.

With regard to breeds, one difficulty we in Queensland have to contend with is the difficulty in procuring the right type of crossbred ewe. It therefore becomes necessary to breed the future mothers of the lamb-raising flock. With this object in view, the farmer would be well advised to secure the boldest and strongest possible type of merino. Those ewes culled on the stations for broadness of fibre are best suited for the purpose, having size and constitution. These should be mated with one of the English long-woolled rams, and for preference, and taking everything into consideration, I should choose the Romney Marsh. The ewe lambs in the resultant drop should be saved as the future breeders.

On this half Merino-Romney Marsh cross it is advisable to put a Downs or short-wool English ram. Southdowns, Leicesters, Border Leicesters, and Dorset Horns are all to be recommended under certain conditions; and of these I would advise the farmer to use the Dorset Horn on account of the fact that he, like the Merino, will work at any season of the year. This is of importance where the farmer is concerned, as it may be necessary in some seasons to have the ewes dropping for a specific purpose at a certain time.

The progeny of the Dorset Horn ram from the crossbred Merino-Romney Marsh ewe gives a very shapely lamb, early maturing, and a good doer. The wool from the ewe recommended, Merino-Romney Marsh, is not to be despised, the cross being a good one; but it should always be remembered that the fat lamb is of the first importance, the wool in this branch of the industry being a secondary consideration.

It does not follow that, because I have here recommended a certain line of breeding that I have anything against the other English breeds mentioned. The Southdown produces an excellent lamb, especially on rich pastures, and both the Leicesters are first class in their own particular spheres; but some choice has to be made, and I have selected the Dorset Horn mainly on account of the fact that he will work at any season of the year. This does not apply in the cases of some of the other breeds mentioned.

## Points in Flock Management.

At time of mating the breeding ewes should not be too fat, or a poor lambing may result. They should be strong and vigorous. The rams should be in good condition. To have the ewes in the condition mentioned, grass land is necessary and short feeding periods only should be allowed on the crops. After lambing nothing is too good in the way of feed for the ewes and lambs.

The fat lamb must receive no check in his development, and should be landed for slaughter straight off the teat. Bred as recommended, the lambs should be ready for slaughter and export at from four to five months old. Extraordinary weights are not looked for in the lamb trade, and as long as a lamb is really fat, and a sucker of 33 lb. weight is quite heavy enough. The greatest care should be exercised in marking the lambs. Avoid all dirty yards, and, if convenient, erect temporary yards in the paddock into which the ewes and lambs are to be let go. After the operation and treatment with an approved antiseptic dressing, drop the lambs gently on to grass if possible.

Lambs for the fat lamb trade should be marked when a fortnight to a month old. The whole secret to success with fat lambs is in early maturity. They must never suffer a check from birth to the block, and it is essential that they carry that bloom which nothing but mother's milk can give. Fat lambs should be marketed as they come to maturity. A half-truck now and then when ready. This, of course, applies to local consumption. When the object of the grower is the export trade, it is necessary in most cases to consign the whole drop. Real sucker lambs properly fat should always command a good price. Many young sheep up to two tooth are sold as lamb, but these never bring the price of the real sucker.

### Market Values.

It is too much to say that early fat lambs should net from 5d. to 6d. per lb., plus skin values. Taking the typical lamb at 33 lb. dressed, this gives a return at 5d. per lb. of 13s. 9d., plus, say, 2s. for the skin, or 15s. 9d. per head. The ewes' fleece under ordinary market conditions should return at least 5s. This gives a total gross return of £1 0s. 9d. per head. The drop, too, taking ordinary care, yarding the ewes and rams occasionally at night, should be a heavy one. Ninety per cent. is not too high a figure to reckon on.

Where can the farmer get a better return for his money than this, especially when consideration is given to the fact that the sheep have done his crops good? The breeder would be well advised not to run too great a number. A smaller flock properly bred and looked after will give a better return proportionately than a flock consisting of too great a number to be properly handled and fed on the property.

### No Fear of Over-production.

There is no fear of over-production in Queensland for years to come, and should that day arrive, the export trade offers every inducement. In this connection it must be remembered that only the best are worth while. The export of so-called fat lambs has done the trade no little harm.

Upon written notice the Brisbane Abattoir is now prepared to handle consignments of fat lambs on grower's account.

As indicating the type of lamb required for the trade, I quote the following from the Brisbane Fat Stock report under date 4th September, 1933:—

"*Lambs.*—Only 180 lambs were penned, the bulk of these being fair to good trade quality station lambs, with only one small draft of good trade quality crossbred lambs. These latter realised from 6d. to 6½d. per lb., whilst the station lambs generally sold from 4½d. to 5d."

**TO SUBSCRIBERS—IMPORTANT.**

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

## PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled for the month of September, 1933 (273 days period unless otherwise stated):—

| Name of Cow. | Owner. | Milk Production. | Butter Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| | AUSTRALIAN ILLAWARRA SHORTHORNS. | | | |
| | MATURE COW (OVER 5 YEARS), STANDARD 350 LB. | | | |
| Gentle 2nd of Blacklands | H. D. Giles, Biggenden | 9,165·3 | 401·856 | Sir Hugh of Hillview |
| Rosenthal Hope 9th | S. Mitchell, Warwick | 8,094·5 | 359·283 | Sunshine of Rosenthal |
| | SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | |
| Millstream Lucy 24th | W. J. Barnes, Cedar Grove | 8,275·98 | 362·102 | Whittier of Thornleigh |
| Kyabram Curly | A. H. E. Black, Kumbia | 8,779·8 | 301·205 | Ledger of Greyleigh |
| | JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | |
| Model 2nd of Alfavale (365 days) | W. H. Thompson, Nanango | 13,234·55 | 597·726 | Reward of Fairfield |
| | SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | |
| Evelyn of Alfavale (365 days) | W. H Thompson, Nanango | 14,050·1 | 546·063 | Reward of Fairfield |
| Lady Gentle 2nd of Blacklands | A. Pickels, Wondai | 8,413·3 | 361·023 | Sultan 2nd of Blacklands |
| Red Rose of Trevor Hill | A. E. Vohland, Aubigny | 9,092·9 | 359·9 | Prince of Braemar |
| Blacklands Florrie VIII. | W. L. Burrett, Brookfield | 6,953·55 | 278·372 | Red Prince of Blacklands |
| | JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | |
| Kyabram Gentle | A. H. E. Black, Kumbia | 7,952·55 | 291·097 | Ledger of Greyleigh |
| Dnalwon Picture 3rd | B. J. Nothling, Witta | 6,190·85 | 242·672 | Monarch of Dnalwon |
| | JERSEY. | | | |
| | MATURE COW (OVER 5 YEARS), STANDARD 350 LB. | | | |
| Brownfern of Oakview | F. J. Cox, Imbil | 9,382·15 | 430·581 | Acacia Crusader |
| | SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | |
| Nan III of Woodlands (226 days) | D. R. Hutton, Cunningham | 6,290·47 | 294·853 | Carnation Golden Duke |
| | JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | |
| Lyndhurst Marella (365 days) | J. B. Keys, Gowrie Little Plains | 11,224·87 | 610·791 | Mercedes Noble King of Ogilvie |
| | JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | |
| Meram Fair Lady | F. Maurer, Darra | 5,536·3 | 296·707 | Retford Remus |
| Jersey Maid of Inverlaw | R. J. Crawford, Inverlaw | 5,547·1 | 294·479 | Bruce of Inverlaw |

# Answers to Correspondents.

## BOTANY.

*Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.*

### Rough Poppy; Indigo.

B.S. (Callide Valley)—

The Poppy is *Papaver hybridum*, the "Rough Poppy," a common European weed, naturalised in most warm temperate countries. It is moderately common in Queensland, though not a serious pest. It has not come under suspicion, so far as we know, as a poisonous plant, but probably stock never eat it, or at least eat it to any extent. The symptoms of poppy poisoning are given as excitement, shown by continual movement, by pawing of the soil, increased respiration, and more rapid pulse. In his book on "Plants Poisonous to Live Stock," Dr. H. C. Long says that "this is followed by stoppage of the digestive functions, sometimes a little swelling of the eyelids, and coma, one affected animal appearing to sleep while standing, remaining motionless, and if forced to move walking in an unsteady manner. Finally, the animal falls, and if a fatal result is likely (which is unusual) it remains stretched on the ground; respiration becomes slower, the temperature falls, and after a few convulsive movements death occurs owing to asphyxia."

The other plant forwarded is *Swainsona oroboides*, a species of Indigo or Darling Pea. So far as we know, no feeding tests have been carried out with this particular species. If, as you say, this particular species of Indigo is common on your property, we will consult with other officers of the Department regarding carrying out feeding tests with it.

### Hexham Scent.

C.H.R., Dallarnil—

The specimen is *Melilotus parviflora*, the Melilot or Hexham Scent. This plant was boomed some years ago under the name of King Island Melilot. On sandy soils, and places generally where lucerne and the better class clovers will not thrive, it has some value, especially for fattening, but our experience with it in Queensland has been that stock do not take readily to it. As you suspected, it imparts an unpleasant odour to the milk and cream of dairy cattle which have fed on it. The Hexham Scent is common as a naturalised weed in Queensland during the late spring and early summer months, but dies off on the approach of the really hot weather.

### *Solanum Torvum.*

J.W.M. (Ingham)—

The plant is *Solanum torvum*. It is a pest in places, but does not grow so thickly as Wild Tobacco. It has not been proved to be poisonous to stock, but these Solanums are often suspected, because a fair number of them contain Solanine.

### Candle Nut.

H.T.B. (Kairi, N.Q.)—

The nuts are the common Candle Nut, *Aleurites moluccana*, a tree widely spread over Queensland, New Guinea, the Moluccas, and the islands of the Pacific. the nuts are commonly eaten by people without any ill-effects whatever, but occasionally people are made violently ill by eating them, severe vomiting and gastritis being symptoms. We do not know the reason for this. Probably it is when the nuts are slightly rancid. The nuts contain a drying oil with properties similar to linseed oil. The tree is closely allied to the tree producing the Tung Oil of commerce. In parts of the Pacific the nuts are strung together and burnt like a candle, hence the local name. They give forth a certain amount of flame with a great deal of sooty smoke. It has been thought at times that the nuts would have some value on account of the oil they contain, but inquiries so far made have not shown them to have any commercial demand.

### Patterson's Curse, Roly Poly, *Gaura parviflora.*

S.C. (Pittsworth)—

1. *Echium plantaginium,* Blue Weed. A native of southern Europe, now naturalised and a great curse in some of the southern States, particularly in New South Wales and South Australia. In New South Wales it is most frequently known as Patterson's Curse, in South Australia as Salvation Jane.
2. *Bassia quinquecuspis,* a species of Bindey-eye or ''Roly Poly.'' It is very closely allied to the Galvanised Burr. It is a pest in some localities, but does not seem to spread to quite the same extent as Galvanised Burr.
3. *Gaura parviflora,* a native of North America. It has been naturalised about Pittsworth for some years, but does not seem to spread to any appreciable extent. We have not known a common name applied to the plant. It is not known to possess any poisonous or harmful properties.

### Fat Hen, Bugle, Prickly Lettuce, Pepper Cress, and Red Natal Grass.

P.J.D. (Grandchester)—Your specimens have been determined as follows:—

1. *Chenopodium album,* Fat Hen. Not known to possess any poisonous or harmful properties. Sometimes stock eat these types of plant when they are drying off. When green and succulent they do not seem to be palatable to them.
2. *Ajuga australis,* Australian Bugle. Not know to be poisonous or harmful in any way.
3. *Lactuca scariola,* Prickly Lettuce. This plant has a bad reputation, but so far as our observations go we have never seen stock eat it to a sufficient extent to cause trouble.
4. *Lepidium ruderale,* Pepper Cress. Generally speaking, this plant is freely eaten by stock. It taints milk and cream rather badly.
5. *Rhynchelytrum roseum,* Red Natal Grass. This grass is a very common farm weed, particularly in parts of Coastal Queensland. Farmers have found that it makes quite good ''chop-chop'' for working horses, especially mixed with better class fodder.

### Eucalyptus Oil.

E.W.D. (Goovigen)—

The correct name of the Scented Gum Tree is *Eucalyptus maculata* var. *citriodora.* It has a wide distribution in Queensland, from the Burrum River in the south to Herberton in the north. The extraction of the oil has been rather an erratic industry in Queensland, and we do not know at the present time if any distillation plants are actually working. You could probably obtain this information from the Forestry Department. If you thought of erecting a still for the extraction of the oil, it would be advisable for you to write to the Curator, Technological Museum, Harris street, Sydney, inquiring for the present market prospects of the oil and also for a copy of Bulletin No. 4, ''A Guide to the Extraction of Eucalyptus Oil in the Field,'' price 2s. We recommend you to do this, for the Technological Museum is the centre for all research into Eucalyptus and other industrial oils in Australia.

### Tiger Pear—Trefoil.

''AGRICULTURIST'' (Toowoomba)—

The Tiger Pear is *Opuntia aurantiaca.* It is very different from and a very much fiercer looking plant than the ordinary prickly-pear. It is generally a much-branched, spreading plant, mostly less than a foot high. The joints are very easily detachable and much narrower than those of the ordinary pear. Sometimes they are more or less rounded, particularly towards the base, and are very spiny. The flowers are similar to those of the ordinary pear, but somewhat smaller. The fruit is purplish-red, and usually bears a number of long spines in addition to the ordinary little spicules of pear fruits. The specimen of trefoil forwarded represents *Medicago orbicularis,* a native of the Mediterranean region, naturalised in Queensland and New South Wales. It is, of course, nothing like so abundant as the common Burr Trefoil, which is *Medicago denticulata.*

**Caustic Creeper.**

C.C.B. (Longreach)—

From the symptoms described by you there seems little doubt that the animals have been poisoned by caustic creeper (*Euphorbia Drummondii*), for they are exactly those attributed to poisoning by this plant by most practical stockowners. Feeding tests with sheep and horses in New South Wales have, so far as we know, always given negative results, and, based on this, some people have described the plant as a good fodder. On several occasions in New South Wales the plant has given a positive reaction for the presence of a prussic-acid-yielding glucoside, but repeated tests with Queensland material have always given negative results. However, the symptoms attributed in Queensland to *Euphorbia Drummondii* poisoning are certainly not those of prussic acid poisoning. Dr. D. A. Herbert, when Government Botanist of Western Australia, produced the pecular swellings on the head and neck by feeding rats on *Euphorbia Drummondii.* In South Africa, *Tribulus terrestris,* the Caltrops, a very common burr weed in Queensland with a yellow flower, sometimes known as Bull's Heads and other names, produces a similar disease, in which the ears and head of the affected sheep swell, and when pierced the swelling exudes a fluid. It has been recently found that small quantities of this fluid injected into white mice subcutaneously kills these animals within half an hour when exposed to the sun's rays. A preliminary report on the work, which has just been published in "Nature" for July, 1933, by Dr. C. Rimington and J. I. Quin, states that the disease of "tribulosis" or "yellow thick head" is due to the passage into the blood stream of the plant porphyrin, phylloerythrin, derived ultimately from ingested chlorophyll. Possibly a similar explanation is to be given for poisoning by *Euphorbia,* but of this we cannot be sure. In this particular case the greatest effect would be in hot, sunny weather, and no doubt the condition of the sheep would have an effect also. Certain sheep are much more liable than others.

**Use of Stock Licks.**

J.R.Y. (Eulo)—

The findings of the Agricultural Chemist and the Government Botanist with regard to the samples of fodder are given below. You will readily understand from the general tone of the observations made that they apply to conditions ruling on your property when the samples were collected.

Of course, under your present conditions, no lick is required at all, and there will probably be no necessity for it until the feed has definitely gone off. In a general way, it may be taken that licks are used to supplement deficiencies in pastures, and waters; and possibly for some special alteration in the animal fed, although this would not be likely. For drought conditions, when the value of proper licks is most in evidence, special provision should be made in the constitution of the lick, such, for instance, as the wise and economical addition of a protein. It may be fairly stated that in nearly all cases where a lick is required at all, phosphoric acid is the deficiency. Therefore, either Nauru phosphate or sterilised bone meal should be prescribed. Both contain phosphoric acid, but the bone meal contains a protein as well. Sterilised bone meal should always be used, except for the fact that it is a good deal dearer to purchase and there is not enough of it to fill the demand. You will understand from this that Nauru phosphate, therefore, takes its place of necessity as it were. Practically, the same conditions would apply for scrub or hard winter feeding as apply under drought conditions, but there may be some local reason for varying the ingredients. For instance, on hard scrub (Wilga predominating) it may be necessary to add more laxative in the shape of Epsom salts.

We have endeavoured to give you a brief outline of the general use of licks and the necessity for the use of some ingredient, or the cutting out of another as occasion demands. Now follows a lick prescribed for general purposes and based mainly on the findings of the Agricultural Chemist. It is to be thoroughly understood that the ingredients are to be varied according to seasonal conditions. We have already warned you against the use of too much salt when ewes are in lamb, especially if a protein is contained in the lick. Have on hand, then, and mix as occasion demands—Sterilised bone meal or Nauru phosphate, 40 parts; salt, butcher's quality, 40 parts; sulphate of iron, 5 parts; Epsom salts, 5 parts; linseed meal or some other good meal, 10 parts. When thought practicable, sufficient molasses may be used to bind the whole.

**Cotton Grass, Jerusalem Thorn, Corkwood.**

L.T. (Eulo)—

1. *Cymbopogon exaltatus,* a tall grass. Members of the genus Cymbopogon are commonly known in Queensland as Cotton Grasses. As a general rule they do not possess much fodder value.

2. *Parkinsonia aculeata,* Jerusalem Thorn. Supposed to be a native of tropical America, but now much planted or naturalised in many warm countries. It is a very hardy tree, much planted in western and northern Queensland as an ornamental. In some places it has run out, though we do not think it has become a serious pest.

3. The botanical name of the Corkwood of the West is *Erythrina vespertilio,* the Batswing Coral Tree. This tree is characterised by bearing bright salmon-red flowers. The seeds are borne in pods, the actual seeds themselves being bright red in colour.

**Button Clover.**

J.W.S. (Pittsworth)—

Your specimen is *Medicago orbicularis,* the Button Clover or Button Trefoil, a plant very closely allied to the ordinary Burr Trefoil (*Medicago denticulata*), but nothing like so common. It is not often seen in Queensland, but occurs more frequently, we think, in New South Wales. The plant is undoubtedly a good fodder, but in its green and luscious state is apt to bloat stock. Generally speaking, however, stock prefer these Medicagos when they are slightly wilted or dying off. Even when the plants die the pods are excellent forage for stock. The plant is an annual and dies out at the approach of hot weather. It does not stand up to dry weather very well, but has been cultivated under irrigation in New South Wales, and is said to have proved itself a useful fodder plant.

**Wild Tobacco.**

T.K. (Springsure)—

The ordinary Wild Tobacco of Western Queensland and New South Wales, *Nicotiana suaveolens,* contains nicotine. This alkaloid is generally regarded as one of the most violent poisons known. Some chemical work carried out by the late Dr. J. M. Petrie showed that enough nicotine is contained in one half pound of the green leaf to poison an ordinary sized sheep.

The other plants mentioned—Bindey-eye, Fat Hen, Wild Carrot, and Mustard—are not known to contain any poisonous properties. If there are any plants that you suspect, or of which you have no knowledge, it would be as well to send us small specimens for identification. If you number each specimen and retain a duplicate similarly numbered, names will be returned corresponding to numbers.

**Slimy Cream.**

Inquirer—The Dairy Branch advises as follows:—

Apparently you have bacterial contamination which gives rise to your trouble. The organisms responsible for it are of the ropey milk group, which are found in utensils with which the milk or cream comes in contact, more especially if the utensils are not in good condition. Utensils that are rusted, pitted, or have open seams harbour micro-organisms and should not be used. To overcome the trouble, all utensils that come in contact with the milk and cream should be thoroughly cleansed by first washing in tepid water and then in a hot solution of washing soda, after which they should be sterilized, by the use of steam or by immersion in boiling water. All buckets, strainers, coolers, washing up tanks, and scrubbing brushes used in the dairy should be included. This trouble occurs from day to day, and unless careful attention is given to cleansing and sterilization of all utensils that come in contact with the milk and cream, it will continue. Cows should be prevented from having access to stagnant water. Milk from cows suffering from any form of udder derangement should be rejected.

# General Notes.

### Staff Changes and Appointments.

Executive Council approval has been given to the appointment of Mr. A. E. Gibson, Senior Instructor in Agriculture, as Director of Agriculture, Department of Agriculture and Stock. Following on the above appointment, the transfer of Senior Instructors in Agriculture, as hereunder, has been approved:—

G. B. Brooks, from Brisbane to Rockhampton;

C. S. Clydesdale, from Rockhampton to Townsville; and

N. A. R. Pollock, from Townsville to Toowoomba.

Mr. T. E. Tuck, Inspector of Slaughter-houses, Coolangatta, has been appointed also an Inspector under the Dairy Produce Acts.

Constables H. Wacker (Cooran) and A. L. McLeay (Silkwood) have been appointed also Inspectors under the Slaughtering Act.

For the purposes of the control of banana pests and diseases, the following have been appointed Honorary Inspectors under the Diseases in Plants Acts in the districts specified:—F. D. Schmidt (Beenleigh), A. W. T. Petty (Ormeau), F. C. Ludcke (Eagleby), F. Stern (Carbrook), W. Benfer (Beenleigh), E. Fischer (Maroochy River), and E. Burke (Springbrook).

Mr. A. Hossack, Inspector of Dairies, who will take up duty at Laidley shortly, has been appointed also an Inspector under the Stock and Slaughtering Acts.

Mr. W. C. Woodhouse, District Inspector of Stock at Maryborough, has been appointed also an Inspector of Dairies.

Mr. E. T. Gale, Manager of Nalcoombie Station, Springsure, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. W. E. Black, Ranger under the Animals and Birds Acts at Mackay, has been appointed also an Honorary Ranger under the Native Plants Protection Act.

The Officer in Charge of Police at Alma-den has been appointed also an Acting Inspector of Stock and Inspector of Brands.

Constable R. E. P. Willis, of Birdsville, has been appointed also an Inspector of Brands.

The Officer in Charge of Police, Pittsworth, has been appointed also an Acting Inspector of Stock.

Constable H. J. Watts, Carmila, has been appointed also an Inspector under the Slaughtering Act.

### Fruit Fly Prevention, a Timely Prohibition.

A new regulation has been issued under the Diseases in Plants Acts, which provides that the occupier or owner of an orchard shall not permit fruit, whether diseased or not, to lie on the ground. If the orchard is in the Stanthorpe district, the owner shall place any diseased fruit in a pit not less than 6 feet long by 5 feet wide by 20 feet deep (or such lesser size as may be approved by an Inspector) which is provided with an insect proof cover with a movable panel therein. Such pit shall be kept closed at all times, except when the panel is open for the purpose of placing fruit in it. If the orchard is elsewhere than in the Stanthorpe area, diseased fruit shall be destroyed by boiling or other method approved by an Inspector. The above should prove an effective means of controlling the fruit-fly infestation in the Stanthorpe area.

### Egg Pool Board.

Executive approval has been given to the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts, giving notice of intention to extend the duration of the Egg Pool from 1st January, 1934, to the 31st December, 1938. Not less than 10 per cent. of the growers of eggs owning fifty or more domesticated fowls may forward a petition, to be lodged on or before the 20th November, 1933, for a poll on the question as to whether or not the functions of the Egg Pool should be continued.

Nominations will also be received, until the 20th November next, for election for one year from 1st January, 1934, as Growers' Representatives on the Egg Board.

# Rural Topics.

## Care of the Working Horse

Most derangements of the digestive organs of horses are due to errors in diet, and a good and regular system of feeding will do more than anything else to prevent trouble of this kind. The following rules for feeding are generally accepted as correct:—

1. Water before feeding, and not for at least an hour after.
2. Feed in small quantities, and often.
3. Do not work hard immediately after a full feed.
4. Never give a horse food to which it is not accustomed in large quantities.

If the above rules are followed, and care taken to ensure that only sound, good food is fed, very little trouble will be experienced.

## Export Butter Restriction—A New Zealand Viewpoint.

Thus the "New Zealand Farmer":—The conversational stress about the quota question has eased very considerably since last month's notes were made, and we are all very much cooler under the collar. It will be remembered that when the Dairy Produce Board first announced its desperate resistance to the proposed limitation of export of New Zealand butter and cheese to Britain, there were insistent declarations that a further fall in price, amounting to ruination, would inevitably result if that attitude were persisted in. The leaders of the dairy industry, however, firmly held that the London talk was merely designed to scare the New Zealand producers into accepting the quantity restrictions. Fortunately, a state of complete panic was not created in this Dominion.

"Did you notice," said one influential dairy director, "how quickly the tone changed as soon as it became definitely realised that New Zealand and Australia (so far as the producers were concerned) were both determined to rest on the terms of the Ottawa agreement?"

One had noticed it, of course. On 9th April the bears had got New Zealand butter down to 65s. to 67s., Danish at that time being quoted at 88s. to 90s. A few weeks of almost dreadful uncertainty followed, whilst the controversy continued. And then, on 9th June, New Zealand finest salted was quoted at 82s. to 83s. (with 1s. to 2s. extra for unsalted), whilst Danish was fetching 92s. to 94s.

"And," continued this authority (if there is such a thing as an authority on the mysterious movements of the markets), "the most singular thing about the business is that the disparity between Danish and New Zealand prices has been reduced from 20s. to 10s.—10s. per cwt. in favour of New Zealand butter, the lowest margin of difference I have seen for a long time."

"But do you suggest," I asked, "that the speculators are the principals in these suggestions, threats, and price variations?"

"Well," was the compassionate reply, "what do you think?"

* * * * * * *

I could venture no definite opinion. The welter of conflicting opinion had reduced me in some degree to a state of mental confusion. It was only in March that a message from a leading Tooley street house emphatically stated: "The only cure for the present demoralisation of the values of butter is immediate restriction; otherwise chaotic conditions will ensue." Cable messages were hotly contending that the saturation point had been reached; the butter glut was a national nightmare. But unrestricted production went on; increased shipments were forwarded. The figures for ten months up to 31st May, 1933, showed that New Zealand had graded the enormous total of 123,660 tons of butter, an increase of 22,572 tons (or 22.33 per cent.) over the total for the corresponding period last season. And yet, early in May, a spectacular rise in the prices of both butter and cheese took place. Now the newspaper headlines sparkle with: "A General Uplift," "Everything Rising," "Brighter Prospects," "Optimism in Trade." During the latter months of the Coates Administration the then Prime Minister seemed to have a monopoly of that comforting assurance that we were "turning the corner," but everybody seems to be doing it now.

### Large Whites—A Heavy Litter.

In the endeavour to create Ton Litter records many breeders were keenly interested, and spent considerable time and effort in pushing their pigs on to early maturity.

As an instance, T. M. Noble's (Victoria) first ton litter consisted of ten pigs, being by Finchley Bar None (imp.) from Finchley Promise 11th, a daughter of the imported Dalmeny Justice. This litter reached the ton in 23 weeks 4 days, but no record was kept of the food consumed. The second and record litter from Mr. Noble's stud consisted of twelve pigs sired by Aldenham Bugler (imp.) from Finchley Maple, a daughter of an imported sow. The litter consisted of five sows and seven boars, six of which were shown as barrows. They were weaned at nine weeks, and every two weeks thereafter were weighed under official supervision. Except for a fortnight, at weaning time, the pigs were always in the open, being born under a straw stack, and all had a good run on grass until within a fortnight of completing the test.

Food consumed from the time they were six weeks old till they reached the ton consisted of 300 lb. of gristed barley, 2,580 lb. gristed wheat, 12,360 lb. skim milk. The cost of the grain was £7 4s. 8d. and the skim milk, taken at ½d. per gallon, £2 11s. 6d., total £9 16s. 2d. While consuming the above feed, the pigs put on 1,416 lb. live weight, which is equal to 944 lb. dressed weight, at a cost of 2.49d. per lb. without allowing for the grass. As the ruling price at the time was 4½d. per lb., they showed a fair margin of profit. One boar and one sow from this litter were exhibited at Melbourne Show, 1931, the boar winning in a strong class, and the sow taking second place in her class. Following are the weights at the times weighed:—

| | |
|---|---|
| At 10 weeks | 837 lb. |
| At 12 weeks | 996 lb. |
| At 14 weeks | 1,260 lb. |
| At 16 weeks | 1,605 lb. |
| At 18 weeks | 1,900 lb. |
| At 18 weeks 6 days | 2,092 lb. |
| At 19 weeks 5 days | 2,253 lb. |

It is of interest to note that the sire of this litter, Aldenham Bugler (imp.), is a very large pig, his length from between ears to butt of tail being 6 feet 3 inches, girth 6 feet. These measurements were taken when he was in good working condition.

### The Best Pasture for Dairy Stock.

The ideal pasture should contain an admixture of grasses and clovers. A leguminous content is important in any pasture—it is essential in dairy pastures. Legumes serve a second useful purpose in Australian grasslands—namely, they increase the soil fertility. A profuse growth of pasture legumes, such as that usually associated with a dense cover of well-manured subterranean clover, builds up soil condition so that the habitat is made more conducive to the growth of high-grade perennial pasture plants.

The ideal dairy pasture is one where high-production perennial grasses and clovers are dominant. Climatic, soil, and economic factors often make it difficult or impossible to maintain this ideal pasture type in Australia, often because suitable perennial clovers are not yet forthcoming. In parts of temperate Australia subterranean clover offers an outstanding example of an annual legume which serves, to all intents and purposes, the function of a perennial.

Good strains of perennial rye grass, true *Phalaris tuberosa*, and improved strains of cocksfoot, are outstanding grasses of a perennial nature which are being used successfully on dairy pastures in many parts of Australia.—From Mr. William Davies' report on the dairy pastures of Australia. Mr. Davies (of the Aberystwyth Plant Breeding Station, Wales) recently spent twelve months in Australia on pasture investigational work.

### A Sagacious Cow.

A cow owned by Mr. E. Hopping, a dairyman, of Ryde (near Sydney), showed remarkable intelligence and motherly instinct during the week. It had been turned out at Liverpool for about a month, and in the meantime calved. Last week it was taken back to Ryde by motor truck, while the calf was left behind. Within a couple of days it disappeared from the dairy, and the loss was advertised by the owner, who later received word from Liverpool that the cow was outside his property. In order to reach its destination the cow swam the Parramatta River and travelled almost direct to Liverpool in less than thirty-six hours.—"S.M. Herald."

**Facts for the Beginner in Poultry Raising.**

In a recent address on the poultry industry, the Poultry Expert of the Department of Agriculture drew attention to some facts which are commended to the notice of those considering taking up poultry farming as a livelihood.

It should not be thought, pointed out the speaker, that poultry farming is a simple occupation which may be taken up when everything else has failed, and it must be realised that among the main essentials for success are sufficient capital to provide proper equipment, an aptitude for the work, keen observation, and infinite capacity for details, and the realisation that it involves working early and late practically seven days per week, particularly during the half of the year when the chickens are being raised.

*Cost of Establishing a Farm.*—The cost of establishing a poultry farm is often under-estimated by those entering the industry, with the result that many invest a few hundred pounds of hard-earned savings in a farm, struggle along for a year or so, and then find that they have undertaken a hopeless task; hence the reason for numerous farms being on the market. To put the matter of cost of working up a farm in a nutshell, it may be stated that the expenditure will amount to at least £1 for each layer, exclusive of providing a residence, which means that to establish a farm carrying 1,000 layers would cost £1,000, plus a dwelling. This amount would cover the purchase of 5 acres of land, the materials for poultry buildings, breeding stock or chickens to commence, sundry tools and appliances, and living expenses (30s. per week) for two years while the flock was being built up. It will be noted that no allowance is made for labour, it being assumed that the farmer would erect his own buildings and runs. This expenditure would only provide bare essentials, but is based on erecting buildings, which, while not being elaborate, would be a lasting asset.

It may be contended that many of the most successful farms of to-day were started on a very small capital, which is quite true, but in such cases the farmer had other means of earning a living while the farm was being built up, and it may have taken a number of years to reach the point where the farm was self-supporting. The position to-day of the majority of people taking up poultry farming is that they have no employment, so that the amount of capital available has to cover the cost of building up the farm and also living expenses for two years while increasing the flocks. The question may be raised as to why the farm could not be stocked in one year so as to obtain a quicker return. This, however, is not practicable, because it is not possible to buy laying stock at a price which would return a profit, and to attempt to rear sufficient chickens in one year to stock a farm would involve an outlay of twice as much in buildings and equipment as would be necessary to work it up in two years.

*Reduced Returns in Recent Years.*—While poultry farming is, perhaps, still one of the best paying small industries, the returns during the past couple of years have been adversely affected in common with all primary products, while the fact that many hundreds of people have taken up poultry farming during that time has also tended to bring down prices. As a matter of fact, the time has arrived when a much greater increase in production of eggs would mean that saturation point would be reached, notwithstanding the fact that there has been an enormous increase in the number of eggs exported from New South Wales, amounting to a total of 6,000,000 dozen last year.

The period over which export can be carried on is limited, and our population is not large enough to consume many more eggs than are produced at present. The position is also accentuated by the influx of eggs from other States, due to the better market prices ruling in Sydney. To relieve the local market of the surplus production it is necessary to commence exporting so early that a definite loss is incurred on all eggs despatched during the first couple of months of the exporting season, and it is essential that eggs be shipped away a couple of months later than is safe from the point of view of covering expenses. Were it not for organised marketing under the control of the Egg Marketing Board it would not be possible to carry on export operations on such an extensive scale, and the returns to the poultry farmer would be considerably less than at present.

The loss sustained on early and late exports has to be made up by profits during the middle of the season and the penny per dozen pool contribution made by poultry farmers. It, therefore, means that unless something can be done to stimulate local consumption of eggs, or other markets can be found overseas, which is not likely at present, there cannot be much more extension of the industry without lower prices to the producer, and when it is pointed out that the return per hen at the present time is only just half what it was in normal times it will be realised that the industry could not stand any further reduction. On last year's

returns a well-managed farm, carrying a flock of 1,000 layers, would only produce an income of £250, out of which would have to be deducted any interest on capital, rates and taxes, &c., thus the poultry farmer does not receive much to compensate him for long hours and the capital invested.—A. and P. Notes, N.S.W., Department of Agriculture.

### How to Keep Cream Cool.

The first step to choicest cream is to reduce the risk of infection by absolute cleanliness at every point. The second is to prevent such organisms as have gained access from multiplying to sufficient numbers to cause trouble. The only way to do this is to cool the cream as much and as soon as possible.

In a climate such as ours, this is one of our biggest troubles. In the absence of water being laid on to the separating room, any of the small water-bag coolers, to cool the cream straight from the separator, are very efficacious, as every degree we bring the cream below 80 degrees Fahr., will have a retarding effect on the bacterial development, and in many cases (in relation to weed taints, &c.) the aeration will improve the flavour. If a cooler is not available a lot can be done by standing the cream cans in cold water, or putting wet bags round them, but it must always be remembered that fresh water is advisable each day, and the bags should be changed each day and allowed to dry. The cream should be stirred with a tinned metal stirrer two or three times each day, and not be mixed until each lot of cream is cool. Finally, the cream should be delivered to the factory daily, if possible.

Boiled down, the production of a first-class article means:—(1) Thorough and systematic cleanliness; (2) keeping the temperature of the cream as low as possible: (3) delivering the cream to the factory as soon as possible. Many dairymen, after taking as much care as possible on the farm, allow the product to become heated in transit to the factory, either by not having a well-shaded stand or, when they do the carting themselves, by not taking the trouble to keep the cans covered (by, say, clean wet bags). This neglect may very often be fatal.

### How Accidents are Caused.

Experience shows that some of the most prolific causes for accidents are projecting set-screws from collars or wheels on revolving shafts.

In connection with farm machinery, the following points should be noted:—An open gear is never justified, and even a partly open gear is a source of danger. There should be no exposed shaft ends, and a flat board up against them is a simple and cheap protection. In some countries, under compensation laws, all shafting less than 6 feet 6 inches from the ground or floor must be protected.

Remember that a plain shaft revolving can be a very dangerous matter. We have seen a lad killed while passing under a revolving shaft. His coat caught, and he was swung around it at fearful speed.

Note also the pulleys should be guarded. You can get caught in the spokes of a plain pulley or may have a tool in your hand and have your hand drawn into the spokes. A great many accidents are due to the handling of belting while the machinery is in motion. An inexperienced man may put on dressing on a belt the wrong way or may try to slip on the belt while the pulleys are running and get his hand drawn in.

Circular saws are also dangerous, but are now far better protected than they used to be, but there should always be care taken in handling any power saw. A common cause of accident with circular saws is that of a man using his hand to clear from the blade a small cutting. In using a lathe a man may also use his hand to clear the tool point. Many fingers have been lost through this lack of care.

All machines should have guards to prevent chips flying. In using the emery wheel, the man who has seen an accident due to the work getting between the wheel and the tool rest, will take care in future. Yet he may have had his eye badly injured by a flying particle of the wheel, and still grind in future without the safe precaution of putting on a pair of goggles. It is a wise plan to have a pair of goggles hanging beside the wheel at all times, so that there is no excuse to risk the eyesight.

Many accidents are due to poor light, and a good light is essential where a machine is in use. You have heard of men losing an eye from a burr flying off the head of the chisel or anvil tool. Why not remove this burr, or mushroom top, on all chisels and anvil tools by grinding.

It is a good policy to see that your machines are so guarded that accidents, as far as possible, may be prevented. It pays in the elimination of risk—both for yourself and for those whom you employ. Better safe than sorry.—"Blacksmith and Wheelwright."

**Summer Cultivation.**

During the spring and early summer the soil of the orchard should be kept free of weeds and the surface loose. For this purpose it is a very common practice to make frequent use of orchard cultivators.

The cultivator certainly covers the area rapidly and is useful in quickly checking evaporation by breaking up a crust formed after rain, but there are objections to its too frequent use (observes a departmental pamphlet). The surface soil becomes too fine, which prevents subsequent rain from freely percolating through it, and thus much of the moisture flows away or is evaporated instead of soaking in, and if much flowing occurs surface soil is also carried away. The fine soil also becomes easily caked even by small falls of rain, and the mulch is, therefore, easily destroyed, and in showery weather requires very frequent renewal. Constant use of the eltivator also forms a sole pan; thus as the season progresses the mulch becomes more shallow and, consequently, less lasting, while the sole pan also prevents free percolation of rain or artificially applied water, which means further loss by evaporation or actual flowing away.

The plough, on the other hand, leaves the surface in a condition which allows the rain to percolate more freely and forms a more lasting mulch, as it is not so easily destroyed by light rains; the plough, moreover, is more efficacious for keeping down weed growth. Weeds are not harmful until their roots have extended through the mulch and are drawing on the moisture below, but if one is depending on the cultivator to keep them down they must be dealt with while they are far smaller than if one uses a plough.

Summarised, the arguments for greater use of the plough for summer cultivation are that a more enduring mulch is obtained, weeds do not require such frequent attention, water is enabled to percolate more readily, and loss of surface soil is reduced. It is only fair to state that heavy rains, which will destroy the mulch, may occur soon after the use of the plough, and in such cases the advantage of the more lasting mulch is lost; however, this does not always occur, and the other advantages remain. The cultivator should be looked upon as a quick substitute, and should be used chiefly when it is desired to check immediate evaporation, and the work should be more thoroughly carried out with the plough later as time permits.

One objection to the use of the plough for summer cultivation is that it upsets the levels of the land. This is of greater importance where irrigation is practised. The drawback can be minimised, if not wholly overcome, by using a plough with the mouldboards removed.

It is sometimes argued that it is risky to use a plough among deciduous fruit trees during their active period on account of injury to the roots. Undoubtedly, by the careless use of the plough damage can be done, but though it may not be so discernible, careless use of the cultivator can also cause root injury. Moreover, because the plough maintains a deeper mulch throughout the season, as already mentioned, the trees are prevented from forming roots too close to the surface. The greatest risk of serious root injury occurs when the later winter ploughing is delayed until the trees are active in the spring—feeding roots are disturbed just when there is heavy demand on the tree by blossoming and fruit setting.—A. and P. Notes, N.S.W. Dept. Agric.

**Neatsfoot Oil Keeps Harness in Good Order.**

For keeping harness in good order, neatsfoot oil needs no recommendation to farmers. The following simple recipe for its manufacture is taken from the "Agricultural Gazette" of New South Wales:—

Neatsfool oil is made by boiling in a suitable receptacle the feet and leg bones (up to the knees) of well-grown cattle. The material should first be thoroughly cleaned by scalding and scraping it free from hair, dirt, &c.; it should then be covered with water, which should be brought to the boil and then allowed to simmer for about two hours. After the oil has risen to the surface it should be skimmed off and the mixture boiled again, and a second skimming made.

The oil thus secured should be strained through a piece of cheese cloth, in order to remove pieces of flesh, &c., from the mixture, and the strained product should then be boiled again, great care being taken that it does not catch fire. Finally, it should be strained again, cooled, and bottled. Pure neatsfoot oil should be light lemon in colour.

The method described is for manufacture on a small scale. Manufacture for trade purposes necessitates the use of a much more detailed and tedious process.

# The Home and the Garden.

## OUR BABIES.

*Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.*

### THE CHILD WHO "WON'T EAT."

**Plain and Wholesome Advice.**

IT is not very long since we dealt with this problem under the headings "Tommy Refuses his Dinner" and "Betty's Tangled Troubles." We fear some of our readers took these for fictions. But Betty was a real child, whose case was studied by a learned professor, and Tommy is such a common character that all should know him. The same topic was lately treated in the column headed "Our Babies" in the New Zealand newspapers, some of which we reprint. The advice given is plain and wholesome, and we commend it to those Queensland mothers who are in need of it.

There are just three reasons why a child will not eat.

First: He is sick. No one (adult or child) will eat when he is sick. During illness the digestive capacity is lowered, and refusal of food is Nature's signal that food is not required. The child who is not well should not be forced, coaxed, or cajoled to take food.

The second reason for not taking food is that the child is not hungry for food at that particular meal time. A very few children are naturally small eaters, but in the majority of cases a child who refuses because he is not hungry has had something to eat between meals. There is but one rule for this, and that is to *stop*—absolutely stop eating between meals, including sweets of any kind.

The third reason is the most usual, and has its beginning in the other two. By not eating he gets something which he wants more than food—to be important and the centre of someone's attention. The child soon learns that by refusing to eat he gets much more attention than he does by "being a good boy and eating his porridge." Not only does he enjoy being the centre of attention at meal time, but he enjoys being talked about afterwards. It is a distinction. "I am a peculiar boy. I don't eat any porridge." No healthy child will starve or become under nourished if allowed to do without a few meals or go short for a time, and a little genuine hunger will often work wonders, combined with the salutary lesson that the matter of meals is not so important to the adults as he thought. Once the child realises that he can simply take his food or leave it as far as anybody apparently cares, the chances are that he will take it.

**The Parents' Duty.**

The parents' duty, then, is to provide suitable food and, having placed the child in contact with that food, to refrain from obvious, anxious effort to induce the child to eat. In other words, the child's relationship to his food is represented by a straight line—child to food; and not by a triangle—child, parent, food.

## WOMEN GOLD MINERS.

Women farmers are to be found in every district in Queensland; in fact, from the earliest days of settlement women have had a tremendous influence on agricultural and pastoral development in this country, and "The Women of the West" is a common theme of song and story. Women have now entered the mining field as working miners, according to this extract from Warden Frank G. Illidge's report in the "Queensland Government Mining Journal" for October:—

Although few women actually engage in the search for gold, many are playing a big part in the venture. Joining their husbands and brothers in the rough camp life, sharing their too often hard and meagre fare, their courage is a wonderful tribute to the womanhood of Australia.

On Three Moon Creek, Mrs. W. King is busily engaged in puddling dirt in a wooden trough and cradling and dishing the residue. Her claim is situated a quarter of a mile distant. She has no shaft, but cuts the earth out of the bank and wheels it down in a perambulator to the trough. Her three small children, the youngest boy seventeen months old, all looking a picture of health and tidiness, follow her from place to place, and no doubt lend a hand when required. Thus she combines her maternal duties with the fascinating and profitable work of gold getting. The inevitable specimen bottle was proudly exhibited, and, although not full, contained sufficient to justify the cheery optimism of its owner. Surely, when haloes are being distributed in the hereafter, hers will contain a bright little star for her pluck!

In another locality a less successful attempt was recently made. A stranger to the district brought his wife and two bright young daughters into the district, and pitched his camp near the bank of a creek. A site was selected for a shaft, and while the two daughters attended to the camp duties his wife assumed the responsibility of general manager and braceman while he undertook the role of underground shift boss. All went well until the sink was down 12 feet or so. Leaving the brace for a few minutes while digging was proceeding, the wife returned to the windlass just as the husband, having filled the bucket, pulled the rope down to hook it on. The windless flew round violently, the handle striking the wife in the chest, knocking her flat. When the argument subsided work ceased for the day, and subsequently the general manager resigned, and the shift boss rode into town in search of a job.

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## WHEAT IN THE HOME.

Emphasing in the course of an address at the State Conference of the Agricultural Bureau of New South Wales the food value of whole wheatmeal, Mrs. M. A. Driver pointed out that the process of producing white flour robs the wheat grain of much of its nutritive virtue. Wheatmeal, it was shown, is almost five times as rich in minerals as white flour—a highly important consideration in the maintenance of health. Farm womenfolk were advised to purchase a small wheat mill—it was not expensive and would last for years—and so ensure that wheat, freshly ground, would be available for use in the home.

The following recipes were given:—

### Wholemeal Nut Loaf.

*Ingredients.*—Two cups wholemeal flour (finely ground), 1 teaspoon cream of tartar, ½ teaspoon carbonate of soda, 1½ tablespoons butter, 1 tablespoon sugar, ¼ cup nuts, ¼ cup raisins, ¼ cup sultanas, 1 tablespoon golden syrup, 1 egg, 1 good cup milk.

*Method.*—Mix flour, sugar, cream of tartar, and soda, and rub in butter; add nuts and fruit. Dissolve golden syrup in milk and add to well-beaten egg. Mix all together, put into greased tins with lids on, and bake about three-quarters of an hour in a moderate oven.

A raisin loaf without nuts can be made if desired.

### Wheatmeal Fruit Cake.

*Ingredients.*—Half pound butter, ½ lb. sugar, 1 lb. fine wheatmeal, 6 eggs, 1 teaspoon cream of tartar, ½ teaspoon carbonate of soda, ¼ lb. chopped dates, 2 oz. nuts, ¼ lb. raisins, ¼ lb. currants, 1 oz. mixed peel.

*Method.*—Beat butter and sugar to a cream. Add eggs one at a time and beat for ten minutes. Add fruit, nuts and peel, and wheatmeal, cream of tartar, carbonate of soda, and a little milk if necessary. Put into greased tin and bake from one and a-half to two hours.

**Wheat "Coffee."**

*Ingredients.*—Three large cups of wheat, 2 tablespoons treacle, 1 tablespoon golden syrup, 3 teaspoons salt.

*Method.*—Wash wheat; drain and put into shallow baking dish, sprinkle salt on and mix in treacle and golden syrup, covering well all the wheat. Put into a hot oven and cook for one hour to one and a-half hours, stirring to prevent burning. When well cooked and the colour of the coffee bean when well roasted, remove from oven and allow to cool. Grind through wheat mill and store in sealed tins to keep in the strength.

Use one dessertspoonful of wheat "coffee" powder to each person, and add the hot milk to the coffee when ready to serve.

## SUMMER FRUIT DRINKS.

Nothing is more refreshing or pleasing in warm weather than a well-prepared fruit drink, while from a health point of view the habit of drinking fruit juices needs no stressing. Their wholesomeness may be particularly emphasised as beverages for children, who, left to their own devices, are quick to acquire the taste for them. Many so-called orange and lemon drinks contain no fresh fruit at all, but are made from chemicals and artificial colouring matter. Not only do they not have the food value that the real fruit possesses, but they may be definitely injurious to the child's health.

The only drinks of this kind that the child should be permitted to have should be made from the fresh fruit juice. Mothers who make real fruit juice drinks for their children will not be teased for artificial soda and other harmful drinks. Fruit juices not only satisfy thirst; the natural fruit acids they contain supply beneficial elements to the child's diet.

*Pineapple Drink.*—Wash the skin of pineapple. Place in a lined saucepan with the core and enough cold water to cover. Cook slowly three-quarters of an hour. Add 3 tablespoons or more sugar and the juice of 1 orange or lemon. Strain and allow to cool. Chill and serve.

*Fruit Punch.*—Take ½ cup lemon juice, 1 cup orange juice, grated rind ½ orange, 1 tablespoon grated lemon rind, 1 quart water, 3 or 4 cups of sugar. Cook water and sugar for 3 minutes, cool and mix with orange and lemon juice, rind, &c. To this add the following ingredients:—(1) 1 quart ginger ale, ½ cup preserved ginger cut up finely, (2) 1 cup grated pineapple, 1 pint soda water.

*Fruit Cup.*—Take 2 lemons, 1 quart boiling water, 2 oranges, 4 passion-fruit, 1 ripe pear (if available), 4 tablespoons sugar, few drops cochineal. Wash lemons, peel thinly into a large jug or bowl; squeeze juice and place it in jug with rind and sugar; pour the boiling water over this and cover till cold. Strain into glass jug, colour very pale pink, add slices of oranges, passion-fruit pulp and cut pear or other fruit. Place in ice chest and serve very cold.

**TO SUBSCRIBERS—IMPORTANT.**

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

# Orchard Notes for December.

## THE COASTAL DISTRICTS.

THE planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemmed by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and lemons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Boreaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless

for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

# Farm Notes for December.

ALTHOUGH November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of ensilage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state; consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well

prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

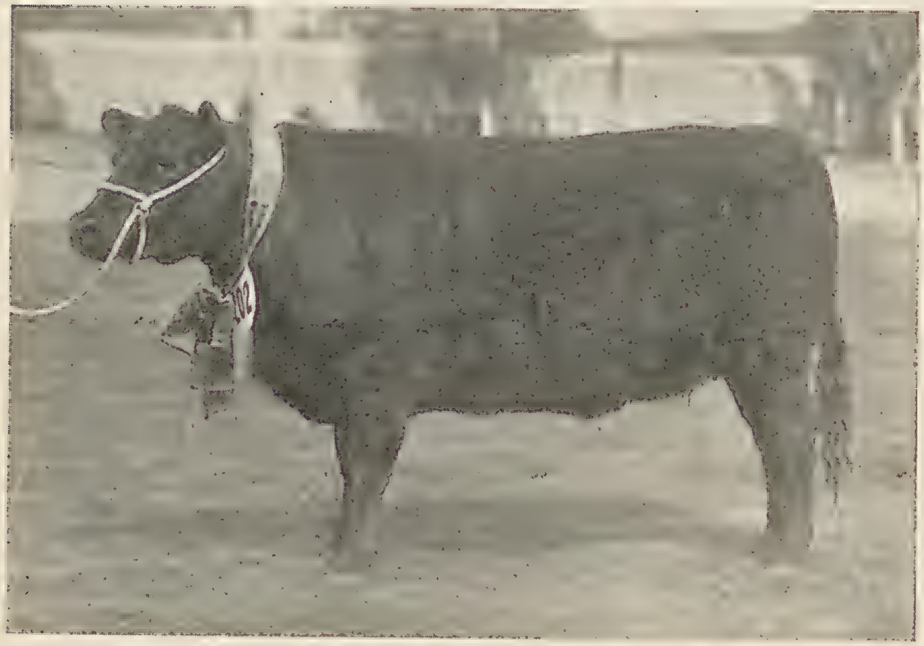

PLATE 124.—BALD BLAIR MERRY.

Winner of the heifer 2 years and under 3 class, Aberdeen-Angus, at this year's Brisbane Show; the property of Messrs. F. J. White and Sons.

## CLIMATOLOGICAL TABLE—SEPTEMBER, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. Means. Max. | Min. | Extremes. Max. | Date. | Min. | Date. | Rainfall. Total. | Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| *Coastal.* | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| Cooktown .. .. .. | 29·95 | 83 | 71 | 87 | 30 | 62 | 12 | 38 | 2 |
| Herberton .. .. .. | .. | 77 | 56 | 83 | 8 | 44 | 12 | 102 | 4 |
| Rockhampton .. .. | 30·08 | 78 | 60 | 87 | 19 | 46 | 10 | 101 | 7 |
| Brisbane .. .. .. | 30·13 | 73 | 56 | 80 | 19 | 46 | 10 | 428 | 9 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. .. | 30·10 | 72 | 50 | 87 | 19 | 33 | 10 | 283 | 9 |
| Stanthorpe .. .. | .. | 64 | 44 | 79 | 18 | 20 | 10 | 220 | 11 |
| Toowoomba .. .. | .. | 67 | 48 | 82 | 19 | 32 | 10 | 234 | 9 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·97 | 92 | 60 | 97 | 24, 27 | 48 | 9 | 70 | 2 |
| Longreach .. .. .. | 30·02 | 83 | 55 | 95 | 18 | 41 | 9 | 85 | 2 |
| Mitchell .. .. .. | 30·08 | 73 | 49 | 83 | 18, 19 | 33 | 9, 10 | 256 | 4 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 29·97 | 90 | 64 | 95 | 12 | 58 | 6, 8, 9, 10, 11 | Nil | .. |
| Boulia .. .. .. | 30·03 | 82 | 56 | 101 | 18 | 42 | 9 | 1 | 1 |
| Thargomindah .. .. | 30·07 | 73 | 53 | 90 | 18 | 38 | 9 | 103 | 5 |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING SEPTEMBER, 1933, AND 1932, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. Sept. | No. of Years' Records. | Total Rainfall. Sept., 1933. | Sept., 1932. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 0·64 | 32 | 1·41 | 0·10 |
| Cairns .. .. | 1·64 | 51 | 2·55 | 0·52 |
| Cardwell .. .. | 1·50 | 61 | 4·02 | 0·07 |
| Cooktown .. .. | 0·58 | 57 | 0·38 | 0·27 |
| Herberton .. .. | 0·51 | 47 | 1·02 | 0·12 |
| Ingham .. .. | 1·46 | 41 | 6·17 | 0·39 |
| Innisfail .. .. | 3·47 | 52 | 4·90 | 0·56 |
| Mossman Mill .. | 1·38 | 20 | 5·24 | 0·45 |
| Townsville .. .. | 0·80 | 62 | 0·92 | 0 |
| *Central Coast.* | | | | |
| Ayr .. .. .. | 1·39 | 46 | 2·40 | 0 |
| Bowen .. .. | 0·81 | 62 | 1·95 | 0·19 |
| Charters Towers .. | 0·81 | 51 | 3·02 | 0 |
| Mackay .. .. | 1·57 | 62 | 1·54 | 0·71 |
| Proserpine .. .. | 2·06 | 30 | 5·41 | 0·90 |
| St. Lawrence .. | 1·29 | 62 | 1·83 | 0·47 |
| *South Coast.* | | | | |
| Biggenden .. .. | 1·52 | 34 | 2·97 | 0·99 |
| Bundaberg .. .. | 1·61 | 50 | 1·21 | 0·98 |
| Brisbane .. .. | 2·03 | 82 | 4·28 | 3·00 |
| Caboolture .. .. | 1·87 | 46 | 3·16 | 3·10 |
| Childers .. .. | 1·82 | 38 | 3·27 | 2·08 |
| Crohamhurst.. .. | 2·61 | 40 | 8·10 | 4·02 |
| Esk .. .. .. | 2·13 | 46 | 2·13 | 2·27 |
| Gayndah .. .. | 1·55 | 62 | 3·45 | 1·00 |
| Gympie .. .. | 2·12 | 63 | 4·15 | 4·00 |
| Kilkivan .. .. | 1·69 | 54 | 3·30 | 1·65 |
| Maryborough .. | 1·91 | 61 | 3·73 | 2·95 |
| Nambour .. .. | 2·53 | 37 | 4·55 | 3·00 |
| Nanango .. .. | 1·81 | 51 | 4·51 | 1·64 |
| Rockhampton .. | 1·35 | 62 | 1·01 | 0·63 |
| Woodford .. .. | 2·18 | 46 | 5·07 | 2·32 |

| Divisions and Stations. | Average Rainfall. Sept. | No. of Years' Records. | Total Rainfall. Sept., 1933. | Sept., 1932. |
|---|---|---|---|---|
| *Central Highlands.* | In. | | In. | In. |
| Clermont .. .. | 1·04 | 62 | 1·92 | 0 |
| Gindie .. .. | 1·01 | 34 | 5·27 | 0·10 |
| Springsure .. .. | 1·26 | 64 | 5·18 | 0·68 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 1·67 | 63 | 2·83 | 1·56 |
| Emu Vale .. .. | 1·76 | 37 | 1·91 | 3·13 |
| Hermitage .. .. | 1·53 | 27 | 2·01 | 2·89 |
| Jimbour .. .. | 1·48 | 45 | 1·99 | 1·20 |
| Miles .. .. | 1·34 | 48 | 1·97 | 1·09 |
| Stanthorpe .. .. | 2·28 | 60 | 2·20 | 2·28 |
| Toowoomba .. | 2·14 | 61 | 2·34 | 3·01 |
| Warwick .. .. | 1·82 | 68 | 2·33 | 3·18 |
| *Maranoa.* | | | | |
| Roma .. .. | 1·41 | 59 | 3·52 | 0·65 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 1·35 | 19 | 2·94 | 0·73 |
| Gatton College .. | 1·57 | 34 | 1·89 | 3·11 |
| Kairi .. .. | 0·63 | 19 | .. | 0·65 |
| Mackay Sugar Experiment Station | 1·45 | 36 | 3·01 | 0·76 |

GEORGE G. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

### AT WARWICK.

| | November. 1933. | | December. 1933. | | MOONRISE. Nov. 1933. | MOONRISE. Dec. 1933. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | p.m. | p.m. |
| 1 | 5·3 | 6·9 | 4·49 | 6 33 | 5·14 | 5·58 |
| 2 | 5·2 | 6·10 | 4·49 | 6·33 | 6·12 | 6·53 |
| 3 | 5·1 | 6 10 | 4·49 | 6·34 | 7·9 | 7·45 |
| 4 | 5·0 | 6·11 | 4·49 | 6·35 | 8·6 | 8·33 |
| 5 | 5·0 | 6·12 | 4·49 | 6·36 | 9·0 | 9·19 |
| 6 | 4·59 | 6·13 | 4·49 | 6 37 | 9·51 | 10·0 |
| 7 | 4·58 | 6·14 | 4·50 | 6·37 | 10·40 | 10·34 |
| 8 | 4·57 | 6·15 | 4·50 | 6·38 | 11·24 | 11·5 |
| 9 | 4·57 | 6·15 | 4·50 | 6·38 | a.m. | 11·35 |
| 10 | 4·56 | 6·16 | 4·50 | 6·39 | 12·1 | .. |
| | | | | | | a.m. |
| 11 | 4·56 | 6·17 | 4·50 | 6·39 | 12·32 | 12·5 |
| 12 | 4·55 | 6·18 | 4·51 | 6·40 | 1·5 | 12·35 |
| 13 | 4·55 | 6·19 | 4·51 | 6·40 | 1·36 | 1·8 |
| 14 | 4·54 | 6·20 | 4·51 | 6·41 | 2·7 | 1·45 |
| 15 | 4·54 | 6·21 | 4·52 | 6·41 | 2·39 | 2·26 |
| 16 | 4·53 | 6·21 | 4·52 | 6·42 | 3·15 | 3·21 |
| 17 | 4·53 | 6·22 | 4·52 | 6·42 | 3·54 | 4·23 |
| 18 | 4·53 | 6·23 | 4·53 | 6·43 | 4·43 | 5·32 |
| 19 | 4·53 | 6·24 | 4·53 | 6·44 | 5·42 | 6·43 |
| 20 | 4·53 | 6·25 | 4·53 | 6·44 | 6·47 | 7 54 |
| 21 | 4·52 | 6·26 | 4·54 | 6·45 | 7·55 | 9·3 |
| 22 | 4·52 | 6·27 | 4·54 | 6·45 | 9·4 | 10·8 |
| 23 | 4·52 | 6·28 | 4 55 | 6·46 | 10·14 | 11·8 |
| | | | | | | p.m. |
| 24 | 4·52 | 6·28 | 4·55 | 6·47 | 11·16 | 12·6 |
| | | | | | p.m. | |
| 25 | 4·51 | 6·29 | 4·56 | 6·47 | 12·17 | 1·8 |
| 26 | 4·51 | 6·30 | 4·56 | 6·48 | 1·15 | 1·59 |
| 27 | 4·51 | 6·30 | 4·57 | 6·48 | 2·11 | 2·57 |
| 28 | 4.51 | 6 31 | 4·58 | 6·49 | 3·8 | 3·53 |
| 29 | 4·50 | 6·31 | 4·58 | 6·49 | 4·5 | 4·49 |
| 30 | 4·50 | 6·32 | 4 59 | 6·50 | 5·4 | 5·42 |
| 31 | | - | 5·0 | 6·50 | | 6·31 |

## Phases of the Moon, Occultations, &c.

| | | | |
|---|---|---|---|
| 2 Nov. | ○ Full Moon | 5 59 p.m. |
| 10 ,, | ☽ Last Quarter | 10 17 a.m. |
| 18 ,, | ● New Moon | 2 23 a.m. |
| 24 ,, | ☾ First Quarter | 5 38 p.m. |

Apogee, 7th November, at 9.42 a.m.
Perigee, 19th November, at 11.18 a.m.

Mercury will come to a standstill amongst the stars of Scorpio on the 8th and will be in inferior conjunction with the Sun on the 18th, so that the loop it will make between October 28th, when 24 degrees east of the Sun, and December 6th, when 21 degrees west of it, will become unobservable. On the 28th it will also become stationary amongst the stars of Libra.

Mars will pass 3 degrees southward of Neptune when getting near the western horizon at 11 p.m. on the 12th, but optical aid will be required to see the planet.

When in inferior conjunction with the Sun on the 18th, Mercury will be about 62,870,000 miles from the earth.

An occultation of Regulus will occur on the 11th when it is still at a good height above the western horizon. Observers should note how far Regulus will be eastward of the Moon at 9 o'clock.

When the crescent-shaped Moon rises—about 8 a.m.—on the 21st, Venus will either be behind it or very close to its eastern limb. This will afford a very interesting occasion for observation. Two or three hours later Venus may be looked for on the western side of the Moon.

When the Moon rises—about a quarter past 10 a.m.—on the 23rd, Saturn will be about 2½ degrees to the west of or above it. It will be occulted when below the horizon in Queensland.

On the 25th Venus will be at its greatest height above the western horizon—rather more than half-way to the meridian—at sunset. Its brightness will increase night after night till January 1st.

On the 28th an interesting sight in binoculars or telescope will be the Moon and Eta Pisceum, a small star of magnitude 3·8, which at Cairns will be very near the northern edge of the Moon shortly after 9 p.m., but will become occulted if viewed from places further south in Queensland.

Mercury sets at 8.0 p.m. on the 1st and at 7.4 p.m. on the 15th.

Venus sets at 9.44 p.m. on the 1st and at 9.59 p.m. on the 15th.

Mars sets at 9.6 p.m. on the 1st and at 9.1 p.m. on the 15th.

Jupiter rises at 3.46 a.m. on the 1st and at 2.57 a.m. on the 15th.

| | | |
|---|---|---|
| 2 Dec. | ○ Full Moon | 11 30 a.m. |
| 10 ,, | ☽ Last Quarter | 4 23 p.m. |
| 17 ,, | ● New Moon | 12 52 p.m. |
| 24 ,, | ☾ First Quarter | 6 8 a.m. |

Apogee, 4th December, at 11.18 p.m.
Perigee, 17th December, at 10.6 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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# QUEENSLAND AGRICULTURAL JOURNAL

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## Event and Comment.

### Boys for the Land.—Speech by the Premier.

"AGRICULTURE is the first essential in any civilisation; it is man's natural occupation. We must use the gifts of our land to the best advantage, and what better settlers could we have than the natives of the country, who know its conditions and do not require to become acclimatised? Every effort the Government can make to assist the development of landmindedness among the boys of our State will be made."

Those remarks of the Premier (Hon. W. Forgan Smith) in the course of a recent speech in the Legislative Assembly found a ready echo on both sides of the House. Dealing generally with the boy employment problem and its relationship to land settlement, the Premier said:—

> Immigration, as every hon. member knows, practically ceased in 1930. The Commonwealth Government, who control this matter, intimated to the British Government that they had suspended the Migration Agreement that had hitherto been in operation. There is no assisted immigration in Queensland or Australia at the present time, with the exception of nominated passengers. The Commonwealth Government agreed to accept the nomination system under restricted conditions; that is to say, if a man is settled here and in employment he is at liberty to nominate his wife and family or his relatives in his country of origin. Obviously, that is a sensible arrangement, but strict inquiries are made as to his capacity to maintain them on their arrival here so that they shall not be a charge on the State or the Commonwealth. Very few nominations take place. I could not say off-hand how many have passed through the Chief

Secretary's Office from 1930 up to date, but the State Government, through their officers stationed in various districts, act as agents for the Commonwealth. When a person is nominated the fee has to be lodged with the clerk of petty sessions or the officer in Brisbane, and is then sent on with a full report of the standing of the person concerned. The Commonwealth officers then decide whether the passage shall be granted.

No new boys are coming out now, but under the terms of the agreement the after-care of the boys who have already migrated here is being continued. I consider that to be a sound and proper course to follow. There are boys who have come to Queensland under the original Migration Agreement, which stipulated that the State should provide an organisation to see that the boys were properly treated on their arrival here and were not exploited by employers, and that, generally speaking, they got that fair deal which would enable them to become absorbed in the population here, develop Australian sentiment and characteristics, and become useful units in our citizenship. So far as that phase of the matter is concerned, undoubtedly such immigration is a distinct success. We have no difficulty in Queensland with these boys at all. Employers are eager to obtain their services, and the wages and conditions are fair in all the circumstances. There are many instances of which I know myself, and others which have been reported to me. Migration officers and the New Settlers' League have found that those boys have become successful settlers. The suggestion has been made that in any large opening of Crown lands the boys who have been successfully settled in the country for a given period and have had experience should have some special area set apart for them so that they can take up land if they wish. No decision has been arrived at on that matter, but they have equal opportunities with others. Generally speaking, this scheme of immigration has been a success, and these boys have been absorbed in the population, and are likely to become successful citizens. In every body of men there is a certain percentage of wasters. One cannot expect to have 100 per cent. perfection in this any more than in any other matter. The boys are being properly cared for.

## Boys wanted for Farm Work.

CONTINUING, the Premier discussed the general question of placing boys on the land, and remarked:—

There is without doubt a demand for boys for farm work at the present time, but that demand is not being met. I have received reports from the New Settlers' League about applications that cannot be entertained because the boys are not available. To me the position is tragic. I view very seriously indeed the fact that the people of this country are not prepared to settle on the land of this country. (Honourable Members: Hear, hear!) That is really a most unfortunate thing; it is probably the most serious social question of the present time. Let us be quite plain and blunt about it. We refer to the tenure of land as being based on the principle of its use, so that it may supply the country with what it needs. If our own native population are not prepared to settle on the land and use the land, then difficulties of a very grave character may arise in the future. The Government, through the Department of Public Instruction and the Department of Agriculture, are doing everything possible to advise senior pupils in the State schools about the opportunities that are available in that direction; but it is not so much that the boys need to be encouraged to contemplate a career on the land—it is a question of converting the parents themselves. I regard it as a pitiful thing that a parent would prefer to have his boy in the city on the dole rather than that he should go on the land and become capable of earning a livelihood. Nothing is worse from the point of view of the morale of the people than that boys should grow up with

the idea that the State must keep them. That is my blunt view about the position. It is the duty of the State to give to all our citizens an opportunity to earn their livelihood, but it is the duty of the individual to earn that livelihood where it is available. (Honourable Members: Hear, hear!) That is a sound principle that I contend cannot be combated, and everyone knows that the most critical period in a boy's life is between the time he leaves school and, say, twenty-one years of age. During that period boys develop those characteristics which determine their future lives. It is then that habits are formed, and good habits can be formed just as well as bad habits. There is no better habit than the habit of work. Work properly done and properly applied is not a curse, it is God's greatest blessing. Life on the land is a variety of work that can be made a habit. The policy of the Labour Government and the policy of every sane thinker has always been to give the men on the land that reasonable chance of earning a decent livelihood which is the birthright of everyone in this country. We must use the gifts of our land to the best advantage; and what better settlers could we have than the natives of the country who know its condition and who do not require to be acclimatised? Every effort the Government can make to assist the development of land-mindedness among the boys of our State will be made. It is however, a matter which the parents should seriously take up with themselves in the light of the future welfare of their families and the future welfare of the country. A quaint idea is current amongst some people that life on the land is a menial occupation. Yet it is the natural occupation of man to till the soil and produce the things that are necessary for the maintenance and comfort of human life. Agriculture is the first essential in any form of civilisation; it is man's natural occupation. Therefore there can be nothing menial about it; it is honourable in the highest degree. It is true that the man on the land has to face considerable difficulties; but does that not also apply to every other kind of human endeavour? The farmer is beset with difficulties caused by droughts, natural pests, and low price levels, but what of the man in the city? Is not the man who follows a clerical occupation subject to the risk of unemployment and its consequent destitution? The artisan—the carpenter or the engineer—spends years of his life in learning his trade. Is it not likely that he will suffer from unemployment? Are not the difficulties of such workers analogous in the ultimate to the difficulties that beset the man on the land? I definitely assert that the efficient agriculturist on good land enjoys better conditions of living than the artisan in the city, who is subject to the fluctuating conditions of unemployment and its consequent difficulties. A very interesting story is recalled to my mind in this connection. I remember not very long ago discussing with a boy his prospects in life. He intimated very definitely to me that it was his desire to go on the land, to cultivate the land, and to become a producer. I questioned him to ascertain definitely whether it was a mere passing whim or whether his desire was deeply rooted. Finally he told me: 'If I can get on to my own farm, cultivating my own land, nobody can give me the D.C.M.' I said: 'That is a new one on me—the D.C.M. What do you mean by the D.C.M.?' He said, 'Don't come Monday.' He went on to say that if he were working in the city his employer at any time could say, 'Don't come Monday,' but if he were engaged upon his own farm no one could remove him from his land, and he would be free to work out his own destiny. That is the kind of spirit that we desire to cultivate amongst our boys, and that is the spirit that will lead to success in any form of human endeavour. I welcome suggestions from any hon. member or from any public-spirited institution that are calculated to remedy the difficulties with a view to settling our own boys on the land, thereby building up a healthy rural population of our own kith and kin.

# A New Disease of Cane in North Queensland.

By ARTHUR F. BELL.

DURING the progress of a disease survey of North Queensland early in 1929, shortly after the formation of the Division of Pathology, we began to form the opinion that in addition to leaf-scald there was present a similar, but distinct disease. On various occasions we found leaf symptoms similar to those of leaf-scald disease, but could find none of the confirmatory symptoms usually associated with leaf-scald. Owing to the very wide distribution of leaf-scald throughout North Queensland one could never be certain that it was not present in any particular instance, and consequently there was always the possibility that these particular leaf markings were but variations of the symptoms of leaf-scald. Laboratory tests failed to confirm this possibility, and although the isolation and culture of the causal bacteria of leaf-scald is a simple matter, in this case no such causal organism could be demonstrated. This possibly new disease was accordingly provisionally termed "pseudo-scald," and its presence recorded in the Annual Report for 1929.

In the meantime, it was learned that an apparently similar disease had attracted attention in Java about the same time, and in 1930 a short account of a new disease was published by the Pathologist of the Hawaiian Sugar Planters' Association. A study of this account left little doubt that the diseases of Hawaii and Queensland were identical; however, during the International Conference of Sugar Cane Technologists in March, 1932, the Pathologists of Java, Hawaii, and Queensland met in Porto Rico, and there found a disease which each identified as being exactly similar to the new disease of his particular country. Furthermore, in Porto Rico, unlike these other three countries, the situation was not complicated by the presence of true leaf-scald and so the symptoms could be recorded with certainty. There can now be no doubt that these four countries, at least, have this disease in common, and that it is quite distinct from leaf-scald. In Java it has been known as "fourth disease," while in Hawaii it was termed "chlorotic streak" disease.

Last spring, with the assistance of Mr. H. G. Knust, of the Tully Cane Pests Board, we were able to obtain a small supply of Badila which was infected with this pseudo scald, or chlorotic streak disease, and which we were quite sure (knowing the complete history of the field) had not leaf-scald disease. Cuttings were brought to Brisbane and planted in the Pathology Plot, one-half of the cuttings being planted without treatment while the other half were given warm water treatment before planting. The cane was planted on 30th August, 1932, and the treated cuttings germinated about one week ahead of the untreated. In spite of frequent watering the very young untreated cane wilted badly in the middle of the day while the treated cane remained turgid and continued to grow at a greater rate than the untreated. When the cane was three months old the characteristic leaf streaks (see page 462 and Plate 125) began to appear in odd leaves of the untreated stools;

they remained visible until the cane was seven to eight months old but could not be found at any later date. Fourteen of the sixteen untreated stools bore these leaf symptoms, while not a single streak was ever observed in the stools arising from the treated cuttings. It is evident then that in this particular experiment, as was found in Hawaii, warm water treatment for twenty minutes at 52 deg. Centigrade had enabled the plants to throw off the disease.

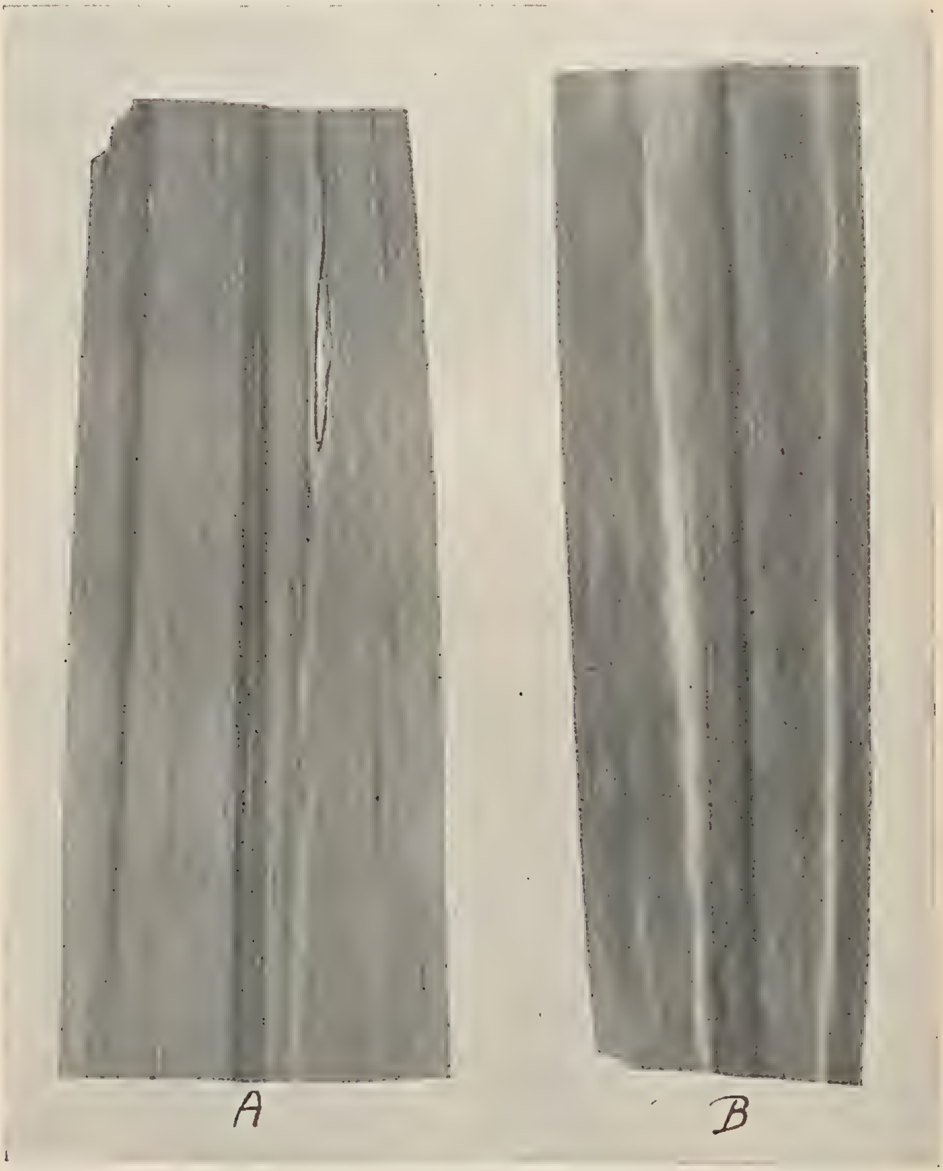


Plate 125.

Typical leaf streaks. In B are shown the more usual narrow type of streak and one of the broader, more diffuse type. Note wavy outline, variable width, and fragmented nature of streaks. In A is shown portion of an older streak in which the tissue has commenced to die; the ashy coloured centre and reddish border of this zone are well illustrated.

Throughout their whole life the stools from the warm water treated cuttings maintained a much more rapid rate of growth than the untreated stools, and when harvested at twelve months old the former greatly out-yielded the latter. The difference in yield will be appreciated on reference to the two photographs reproduced in Plates 126 and 127. In Plate 126 we have a photograph taken at the junction of the two lots of cane, that from the treated cuttings growing to the left of the plot peg, while the stunted stools from the untreated cane lie to the right. A very marked difference in the height of the cane, which could scarcely be due to soil differences, is apparent in the immediately adjacent stools. Parallel with the difference in height of the stools was a marked difference in the stooling habit, the untreated cane averaging three stalks per stool while the treated averaged five stalks per stool. The first twelve stools on either side of the peg were then harvested and placed in two heaps, and again the difference in yield is brought out by the second photograph (Plate 127); the larger heap on the left is composed of cane cut from twelve stools of treated cane while that on the right is the cane from a similar number of stools from untreated cuttings.

Undoubtedly quite a startling difference in yield has been obtained by the planting of the diseased cuttings in contrast to diseased cuttings rendered apparently healthy by warm water treatment. Of course it is well known that warm water treatment of normal cuttings has a stimulating effect on germination (and so on growth), so that if untreated healthy cane had been used the difference obtained may not have been so great. Furthermore, this experiment was carried out in the temperate zone, where Badila is usually cropped as a two-year old cane, and the difference in yield might not have been nearly so great if the experiment had been conducted in the wet tropical belt. Nevertheless the difference in yield is so great as to demand further investigation, and accordingly two field trials have already been planted, one in the Tully area and one in the Mulgrave area. In the former warm water treated diseased Badila is being grown in plots side by side with the untreated cane, while in the latter, diseased and healthy (Tableland Nursery Badila, not treated) cane are being compared.

The symptoms of the disease are easy to describe; the chief difficulty often is to find them in the diseased plant. The leaf symptoms as found in Badila are illustrated in Plate 125. They consist of long, narrow, cream to white, longitudinal streaks in the blade of the leaf, ranging in width from 1-16 to 3-16 inch and rarely being of uniform width throughout their length (see Plate 125B). They run in the direction of the veins of the leaf and may extend the whole length of the leaf but more frequently are less than 1 ft. in length, and are often fragmented. In older streaks the leaf tissue within the boundaries of the streaks frequently dies and assumes an ashy-grey colour surrounded by a narrow reddish border (Plate 125A); these dead areas are at first small but may later extend almost the whole length of the streak. They may be distinguished from the typical young streaks of leaf-scald by the wavy outline and varying width, as compared with the sharply defined uniform streaks of leaf-scald. In the later stages leaf-scald streaks become broad and diffuse, with broad dead areas extending in from the margins, but this is not the case with the disease in question. The streaks do not pass from the leaf blade down on to the leaf sheath as in leaf-scald, while the latter streaks are rarely, if ever, fragmented.

Plate 126.

Striking effect of warm water treatment of cuttings of Badila cane affected with this disease. The larger stools on the left of the white plot peg grew from treated cuttings and remained apparently healthy throughout the life of the crop, while the stunted stools to the right of the peg were obtained from untreated cuttings and bore numerous typical leaf streaks. Cane growing in Pathology Plot, Brisbane.

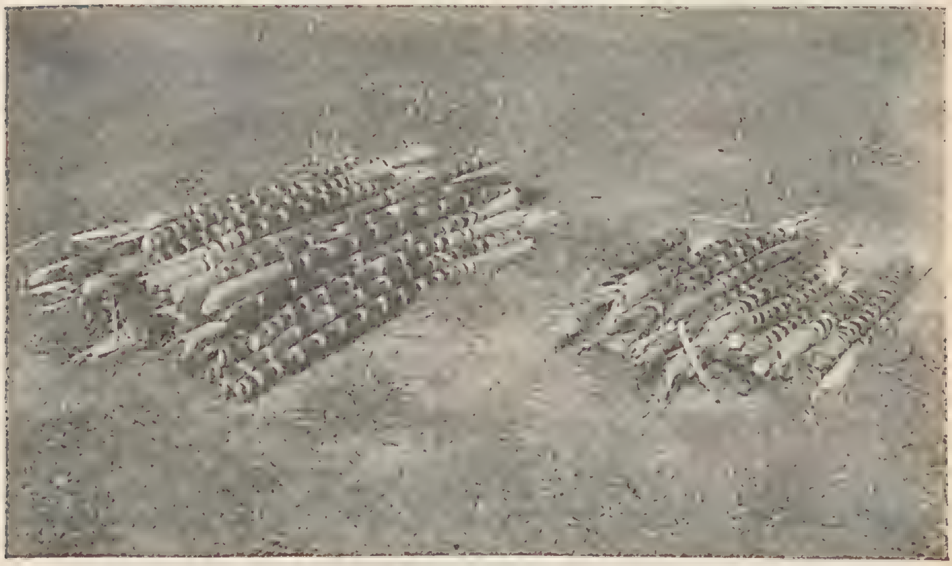

Plate 127.

The cane harvested from 12 stools grown from treated cuttings (left) and 12 stools grown from untreated cuttings (right). See also Plate 126.

Upon cutting open diseased stalks a few reddened fibres may be found but they are not numerous. None of the confirmatory symptoms of leaf-scald, such as side shooting, almost complete loss of green leaf colour, or death of mature cane, can be found.

The leaf symptoms as here described and illustrated are best found in Badila when the young crops are just commencing to make cane—about October-November. As the cane grows higher they frequently disappear, and by the following March it may be impossible to find a single leaf-streak in a field which is known to be approximately 100 per cent. diseased. The streaks are most apparent on the older leaves but they are often not at all numerous, in fact quite frequently only a single leaf streak can be found in the whole stool.

The origin of this disease is not known, but its wide-spread distribution proves that it has been in the country for many years. It has been found in places throughout the area north of Cardwell but a shortage of Field Staff has prevented a farm to farm survey to determine the percentage of farms affected. Its presence has been reported, but not confirmed, on a few farms in the Mackay district, and has definitely been recorded in a field of Badila ratoons on the Maroochy River. In the far north, Badila is, of course, the variety chiefly affected, but the disease has also been recorded in P.O.J. 2722, P.O.J. 2875, P.O.J. 2878, and S.C. 12/4. In Hawaii it has been observed on the following varieties:—P.O.J. 36, P.O.J. 213, P.O.J. 234, P.O.J. 979, P.O.J. 2714, P.O.J. 2727, P.O.J. 2878, E.K. 28, H. 109, Co. 213, Yellow Caledonia (Malabar), D. 1135, Badila, and a number of the newer Hawaiian seedlings.

The means by which this disease is spread from diseased to healthy plants is not yet known and is the subject of investigation both here and in Hawaii. Observations made so far indicate that the rate of spread is slow and that if healthy planting material is used that is all that is necessary to control the disease in most cases. In the meantime it is suggested that North Queensland farmers, particularly, be on the lookout for the disease during the next two or three months, and note its presence or absence in their fields. Should the two field trials at Tully and Mulgrave confirm the indications obtained in the small Pathology Plot trial, they will then be in a position to decide whether they are in need of fresh supplies of planting material, and make plans accordingly.

# Additional Recommendations for the Control of Blue Mould of Tobacco.

By L. F. MANDELSON, B.Sc. Agr., Assistant Plant Pathologist.

THE control of blue mould is fully discussed in the Departmental leaflet "Tobacco Diseases," wherein the following points are stressed:—

(1) Field sanitation, which involves the prompt destruction of tobacco plants after the leaf has been harvested, and of plant refuse, and the eradication of volunteer plants.

(2) A suitable seed-bed site, which is well drained and not in a low-lying situation.

(3) Seed-bed soil, which is sufficiently fertile to ensure rapid and vigorous growth, and which has been sterilised prior to sowing.

(4) The use of seed from plants which have not been affected with blue mould.

(5) The beds should not be sown too thickly, and should later be thinned out to avoid overcrowding and to facilitate efficient spraying.

(6) The seedlings should be "hardened off"—i.e., given sufficient air and sunlight to encourage strong and vigorous growth.

(7) Visitors should not be permitted to inspect the seed-beds.

(8) Should blue mould be observed, the affected plants and those in their vicinity should be promptly eradicated by a heavy application of a formalin solution consisting of 1 part formalin to 25 parts of water. The treated area should later be dug out and the affected plants burnt.

(9) The seedlings should be sprayed with a suitable fungicide as soon as they are above ground.

## Spraying Seed-beds for Blue Mould Control.

As a result of the experiments which are described elsewhere in this issue of the "Agricultural Journal," it is now possible to give fuller information on the subject of suitable fungicides.

For satisfactory results seedlings should be sprayed every four days. Additional applications are advisable when the plants are growing rapidly and after heavy storms. If beds are to be weeded or thinned out, it should be arranged for these operations to be carried out the same day that sprayings are made. It is best to spray seedlings late in the afternoon so that they will not be exposed to the heat of the sun when wet with spray, or else to protect them with hessian until the leaves are dry.

The method of application is most important, since it is essential that the lower as well as the upper surfaces of the leaves be thoroughly covered. Hence the spray should be applied with considerable pressure. A fine mist should be used when the seedlings are very small. Later a

PLATE 128.
Upper Fig.—Incorrect method of spraying tobacco seedlings.
Lower Fig.—Correct method of spraying tobacco seedlings.

flat spray should be applied, first from one side of the bed and then from the other, the spray rod being held at an acute angle to the ground so that the leaves are turned back by the force of the spray. Plate 128 illustrates the manner in which the spray should be applied. In Departmental spraying experiments a "Rega" IA bucket-pump with a combination Bordeaux-cyclone nozzle was found convenient for spraying tobacco seed-beds.

The results of the fungicide experiments may seem at first somewhat conflicting, but when all aspects are taken into consideration it would appear that two fungicides are outstanding and are worthy of recommendation. These preparations are home-made colloidal copper with soft soap as a spreader, and copper emulsion.

The former, probably due to the fineness of its particles and its excellent spreading quality, has considerable fungicidal value. The method for its preparation was only recently described, and consequently it has not been possible to investigate its value as a fungicide for tobacco seedlings very extensively. It has nevertheless given consistently satisfactory results. From the practical viewpoint it has two outstanding advantages over most fungicides—namely, that it is remarkably convenient to use and may be prepared very cheaply. The stock solution is made up simply, and will not rapidly deteriorate. For spraying purposes it is only necessary to dilute it with water and add the required amount of soft soap as a spreader.

Copper emulsion also is in a very fine state of division, and has excellent wetting properties. Unlike Bordeaux mixture it will stay in suspension for a considerable time. It has been more extensively tested than any other fungicide in recent experiments, and has been found satisfactory. Furthermore, it has been used rather extensively on a commercial scale for two seasons with considerable success. Unfortunately, however, it has certain disadvantages for general use. In the first place it can only be made with "soft" water, since "hard" water will react with the soap with disastrous results. It has been found that continual applications of the spray tend to cake the surface of the soil. Furthermore, to successfully prepare this fungicide considerable care is necessary in the accurate weighing-out and mixing of the ingredients. Nevertheless it can be recommended with confidence as an effective fungicide to growers who are prepared to take the necessary care in its preparation.

These two fungicides may be prepared in the manner described in the following paragraphs.

### Home-made Colloidal Copper.

A stock solution of this fungicide is first prepared, and is diluted with water for spraying purposes. A grower may consequently make up sufficient concentrated fungicide for two or three months' spraying operations at one time.

Details for the preparation of the stock solution are as follows:—

One pound of bluestone "fines" is first dissolved in two quarts of water. The "fines" are preferable to crystals, since they dissolve more readily. The bluestone is best dissolved by suspending in a bag in water which may be heated to accelerate the process. It should be

dissolved in a wooden tub or some non-metallic vessel, since this chemical will react with metals. If tins are the only vessels available, they must first be thoroughly coated with pitch. One pint of molasses is next stirred well into the bluestone solution. The solution is finally made slightly alkaline by the addition of a caustic soda solution prepared by dissolving 5 oz. of caustic soda in a quart of water. The caustic soda solution must be added slowly to the bluestone and molasses mixture, with constant stirring.

The above-mentioned quantities will make up about a gallon of stock solution, and should result in a slightly alkaline spray. The additional precaution of carefully adjusting the reaction of the spray may be carried out in this fashion:—

When almost all the caustic soda solution has been added, transfer a drop of the mixture to a piece of blue litmus paper. The colour of the paper should turn pink. Add more caustic soda solution until, when tested, the mixture will not change the colour of the litmus paper. A drop of the mixture should then be transferred to a piece of pink litmus paper, which will probably not change colour. Then a little more caustic soda solution is added so that eventually pink litmus paper will turn very faintly blue. (Litmus papers may be cheaply obtained from chemists.)

The stock solution so prepared should be stored in bottles or some closed non-metallic container. Since it will improve on aging, it should not be used until it is about a week old, when the colour will have changed from green to slightly yellow. In the Departmental experiments stock solution was found to be satisfactory even six to thirteen weeks after preparation.

For spraying purposes the stock solution should be vigorously agitated, and one part diluted in 30 parts of water, and 0.5 per cent. by weight of potash soft soap added as a spreader.

A formula for preparing about 8 gallons of spray is as follows:—

A.—Stock solution, 1 quart; water, 7 gallons.

B.—Potash soft soap, 6 oz.; water, ½ gallon.

When the soap has been dissolved in the water, which may be heated to save time, solution B is added and well mixed with solution A. It is advisable to pump the spray through the spray pump back into the spray vat for this purpose.

### Copper Emulsion.

Considerable care is required in weighing out the materials for this spray, since an excess of bluestone (copper sulphate) will result in the formation of a sticky green precipitate, and too much soap will tend to cause spray injury. Furthermore, it is essential to use only "soft" water in its preparation.

Copper emulsion is prepared by slowly pouring a copper sulphate solution into an equal volume of a potash soft soap solution, with constant stirring, so that the spray will finally contain 0·4 per cent. copper sulphate and 2 per cent. soap by weight.

Bluestone "fines" are dissolved in water as described for the preparation of colloidal copper.

Particular care is necessary in dissolving the soap, and it is more difficult to thoroughly dissolve this substance than may at first be anticipated. If the soap is not all dissolved, the spray will contain an excess of copper sulphate, and the precipitate, mentioned above, will be formed. It is best, therefore, to dissolve it as well as possible the day before it is required, and to soak it overnight in the correct amount of water, so as to ensure that it is thoroughly dissolved before the copper sulphate solution is added.

In preparing the spray it is most important to pour the copper sulphate solution into the soap and not vice versa, since the latter process will result in the formation of the sticky precipitate. By pouring the copper sulphate into the soap solution, there is always an excess of the latter present.

Only potash soft soap should be used. In experimental work "Campbell's Genuine Potash Soft Soap" was found satisfactory for the purpose.

A formula for preparing 8 gallons of spray is as follows:—

A.—Potash soft soap, 1 lb. 10 oz.; soft water, 4 gallons.

B.—Bluestone "fines" (copper sulphate), 5 oz.; soft water, 4 gallons.

Solution B is slowly poured into solution A with constant agitation.

## THE ALSATIAN—ITS ORIGIN.

Mr. James Dickie, in an article in the London "Sketch," says:—Captain A. H. Trapman, in "The Dog, Man's Best Friend," says that "the shepherd dog is neither exclusively German, Belgian, nor Alsatian, but is common to all sheep country in Central and Western Europe."

Actually, this statement seems to need some modification. The Belgian sheep dog, though like the "Alsatian" in make and shape, is smaller, stockier, and is usually all black. Both belong to the wolf-like tribe of dogs, though the Alsatian is the more wolf-like of the two, those having "Wolfshunde" blood being the most wolf-like of all.

Some difference of opinion seems to exist as to whether there is any wolf-cross in the Alsatians, or whether his wolf-like appearance is fortuitous.

The answer seems to be that there are two types of Alsatian; the pure Schaferhunde or sheep dog, and the Schaferhunde-Wolfshunde cross.

In the middle of the last century wolves and dogs were undoubtedly crossed in Germany, and Christian Burger, of Leonberg, a professional breeder, exhibited in 1887, a cross between a wolf and a dog which he called a Wolfshunde.

In 1891, however, a club was formed for the dogs now called Alsatians, and registration made difficult the further introduction of wolf blood.

To this day it is easy to pick out the dogs with wolf blood. The pure Schaferhunde is a comparatively smooth-coated dog with a straight tail level with his back, which is usually dark or black; the Wolfshunde type has a greyish and shaggier coat and a tail tending to curl over his back; he is bigger, more powerful, and more likely to be fierce, especially towards strangers, with whom, as a rule, he will have nothing to do unless properly introduced.

For this reason the Wolfshunde type of Alsatian is an exceptionally good guard; he is, of all dogs, the least likely to make friends with a burglar.

# Fungicidal Experiments for the Control of Blue Mould of Tobacco.

By L. F. MANDELSON, B.Sc. Agr., Assistant Plant Pathologist.

BLUE mould or downy mildew (*Peronospora tabacina* Adam.) has always been the most serious hindrance to the successful production of tobacco in Australia. This disease has been fully discussed elsewhere[2, 5], and the causal fungus of blue mould has been well described recently by Adam[1].

Investigations by Angell and Hill[2] have demonstrated that infection is carried in tobacco seed, and consequently the use of only healthy seed as well as strict attention to field sanitation has been advocated for the control of blue mould. The present general distribution of the disease, however, makes it very difficult, in large tobacco districts, to escape the disease in this manner. Hence it is very desirable to devise some efficient method for the protection of tobacco seedlings.

The use of Bordeaux mixture as a fungicide for tobacco plants has been advocated by various Agricultural Departments, but as Dickson[4] points out, the slight protection so obtained does not warrant the constant spraying which is necessary. Plants sprayed with Bordeaux mixture do not develop blue mould as quickly as unsprayed plants, but once the disease has become established they usually succumb to the disease very rapidly.

In America[3] Bordeaux mixture has also been employed recently for the control of blue mould, but the results obtained have not been entirely satisfactory.

Apparently no serious attempts have yet been made to improve the efficiency of Bordeaux mixture, or to investigate the possibilities of other fungicides for the control of this disease.

The difficulties experienced in the past in satisfactorily controlling blue mould by the use of fungicides are probably associated with three factors which tend to mitigate against their successful application. These factors are:—

1. The fine tomentose covering of the leaves of tobacco seedlings which tends to prevent actual contact with the leaf surface by sprays or dusts.
2. The leaves of young seedlings lie close to the ground, and consequently it is extremely difficult to dust or spray a fungicide on to their lower surfaces.
3. The rapid growth of the seedlings necessitates very frequent applications of fungicides in order to maintain an effective covering.

During the past two seasons experiments have been carried out with the object of overcoming these difficulties.

Since Bordeaux mixture has usually been found effective in combatting other plant diseases, it was considered likely that its efficiency as a tobacco seedling fungicide might be considerably increased if its spreading and wetting qualities were improved by the addition of

supplementary ingredients. Consequently, in the experiments now under discussion various spreading agents were used with this object in view. Various other fungicides were also tested, particular attention being given to those whose active ingredients were in a very fine state of division, since it was considered that such substances were most likely to effectively cover the leaves.

In these experiments dusts were applied with a "Feeny" dust gun, and sprays with a "Rega" 1A bucket pump fitted with a combination Bordeaux-cyclone nozzle, the sprays being applied with considerable pressure. When the seedlings were very small a fine cone-shaped spray, obtained with the cyclone outfit, was employed. A flat, fan-shaped spray, obtained with the Bordeaux section of the same nozzle, was, however, applied as soon as the seedlings were large enough. The spray rod was held at an acute angle to the ground, so that the force of the spray turned the leaves back and hit their lower surfaces. Sprays and dusts were applied first from one side of the bed and then from the other, in order to obtain a covering of fungicide on the leaves on both sides of the plants. All beds were covered with hessian directly after spraying to protect them from the effect of the sun. When dusts were applied the applications were made in the early morning. The first application of fungicides was made as soon as the majority of the seedlings were above ground unless otherwise indicated.

### First Fungicide Experiment.

Seed-beds for the first and second experiments were kindly made available by the Parkridge Tobacco Plantations Pty. Ltd., and were situated about twenty miles from Brisbane.

The object of these preliminary experiments was to test several fungicides and spreading agents in order that the most promising might be more intensively investigated later.

The seed-beds were 6 feet wide and were divided into plots 5 feet long. The end plots and every third plot received no treatment. Blue mould was particularly severe in the district when these experiments were carried out, and was well established in a seed-bed about 20 feet away from the experimental plot. Consequently the beds were well exposed to natural infection.

The first application of fungicides was made on 9th December, 1932, and subsequent applications were made at seven-day intervals. The seedlings were two weeks old when operations commenced.

### Fungicides Applied.

#### Bordeaux Mixtures.

Plot 1.—Bordeaux mixture (2-1-50) used alone.

The following seven plots were sprayed with Bordeaux mixture of this strength, together with the spreading agents indicated below:—

Plot 2.—Potash soft soap (2 per cent. of spray).

Plot 3.—"Vallo" improved casein spreader (at rate of $1\frac{3}{4}$ lb. per 100 gallons of spray).

Plot 4.—"Shell" white oil emulsion (1 per cent. of spray).

Plot 5.—Molasses (1 per cent. of spray).

Plot 6.—Linseed oil (0·5 per cent. of spray).

Plot 7.—"Vallo" benzol emulsion (1 per cent. of spray).

Plot 8.—"Agral No. 1" (0·25 per cent.). This spreader is a sulphonated aromatic derivative, which is reported to have improved the efficiency of fungicides in controlling hop powdery mildew (*Sphærotheca Humuli*)[6] and tomato leaf mould (*Cladosporium fulvum*)[8]. It has also been found to have some fungicidal value when used alone[8].

MISCELLANEOUS SPRAYS.

Plot 9.—Copper emulsion. In this trial a 0·8 per cent. copper sulphate solution and a 4 per cent. potash soft soap solution were used. This fungicide is prepared by adding a copper sulphate solution to a potash soft soap solution, and probably consists in part of copper stearate. It was investigated by Dr. and Mrs. Wormald[10] in 1917 and 1918, and was found to be an effective fungicide for the control of Irish blight of potatoes (*Phytophthora infestans*) in laboratory and field trials. Its particles are in a very fine state of division.

Plot 10.—"Bouisol" at a 0·5 per cent. concentration, together with 0·5 per cent. soft soap as a spreader. This substance is a colloidal copper preparation, containing 12.5 per cent. copper.

Plot 11.—Copper sulphide. Prepared by the addition of 1 per cent. copper sulphate to lime-sulphur (1 in 40). "Vallo" improved casein spreader was added at the rate of 1¾ lb. per 100 gallons of spray.

DUSTS.

Plot 12.—"Fungicidal" dust (30 per cent. copper carbonate and 30 per cent. sulphur).

Plot 13.—"Blu-Mold" dust, which contained 24·5 per cent. anhydrous copper sulphate (water content 0·2 per cent. to 0·75 per cent.). The inert substances were dried by a special treatment, and the dust was in a particularly fine state of division, being fine enough to pass through a 300-mesh sieve.

Plot 14.—"Bordodust" No. 2 (25 per cent. monohydrate copper sulphate).

Plot 15.—"Blight" dust (20 per cent. copper sulphate and 35 per cent. sulphur).

It will be noted that the dusts selected contained copper in various forms—viz., copper sulphate, monohydrate copper sulphate, anhydrous copper sulphate, and copper carbonate. Two contained sulphur as an additional active ingredient.

**Results.**

Blue mould was observed in some beds six days after the experiment commenced. More than likely many plants were affected prior to the first application of fungicides, since they were two weeks old at that time. The beds had not been protected from leaf miner (*Phthorimæa operculella* Zell.) damage, and consequently many plants were injured thereby.

On the 10th January, 1933, when the seedlings were a little more than six weeks old, the relative degree of control obtained with the various fungicides appeared to be in the following order:—

**1. Plot No. 9.—Copper Emulsion.**

During the early part of the experiment the soft soap used was unsuitable and consequently some difficulty was experienced in preparing this fungicide. A curdy precipitate was formed which clogged the spray pump, and the spray was acid in reaction. After the second application the plants were noticeably stunted and their leaves were coarser than the controls. The subsequent application caused burning of the foliage. Hence it was necessary for the fourth and following applications to reduce the copper sulphate content by half. The spreading quality of this fungicide was very good. Blue mould was observed in this plot a week later than in any other plot. Unfortunately spray injury was responsible for a poor stand of plants, but throughout the experiment this fungicide gave the best control of the disease. At the termination of the experiment on the 17th January plants in this plot were more stunted than others, but were a healthy green colour and only a few were affected with blue mould.

**2. Plot No. 8.—Bordeaux Mixture and "Agral No. 1."**

"Agral No. 1" was the most efficient of the spreading agents tested and resulted in a very even cover of the fungicide. This plot was consistently the best of the Bordeaux series, and blue mould did not make its appearance until the plants were five weeks old. The plants were strong and well developed, and almost twice as many plants were eventually removed from this plot into the field as from any other plot.

**3. Plot No. 6.—Bordeaux Mixture and Linseed Oil.**

Linseed oil was difficult to emulsify thoroughly and did not appear to improve the spreading quality of the spray. Nevertheless, notwithstanding the fact that considerable infection was present, the plants in this bed were eventually slightly better than most other Bordeaux mixture plots.

4. Plots Nos. 5, 7, 10, and 13 showed a somewhat similar degree of control.

**Plot No. 5.—Bordeaux Mixture and Molasses.**

Molasses did not greatly enhance the spreading quality of the spray. The spray at first did not give very promising control, but eventually appreciably checked the development of the disease.

**Plot No. 7.—Bordeaux Mixture and Benzol Emulsion.**

Benzol emulsion appeared to be fairly effective as a spreader, and throughout the trial this fungicide was moderately successful in controlling the disease.

**Plot No. 10.—"Bouisol" and Soft Soap.**

As a spray it had good spreading qualities, but the final result with this colloidal preparation was rather disappointing.

**Plot No. 13.—"Blue-Mold" Dust.**

This was better than other dusts in the experiment, but was not as good as many of the sprays, although at this time it was superior to four of the Bordeaux mixture preparations.

**5. Plot No. 4.—Bordeaux Mixture and White Oil.**

The spreader did not appear to greatly improve the spreading quality of the spray. The disease eventually became well established in this plot, but few leaves were killed, and it was superior to some other Bordeaux mixture plots.

**6. Plot No. 2.—Bordeaux Mixture and Soap.**

Soap considerably improved the spreading quality of Bordeaux mixture and increased its efficiency as a fungicide.

7. Plots Nos. 3 and 12 were about equally efficient.

**Plot No. 3.—Bordeaux Mixture and "Vallo" Improved Spreader.**

This spray appeared to spread rather well; however, by the 10th January the disease was severe in this plot, and the treatment did not seem to be as effective as other sprays where spreaders were added to Bordeaux mixture.

**Plot No. 12.—"Fungicidal" Dust.**

This fungicide was the least satisfactory, so far as could be observed, of the dusts tested. It, however, was eventually superior to Bordeaux mixture alone and the control plots.

**8. Plot No. 1.—Bordeaux Mixture (alone).**

This spray did not spread well. Blue mould was observed in the plot three weeks after it had made its appearance in the unsprayed beds, and the plants were then six weeks old. Within five days, however, the disease caused severe damage. Such a sudden decline is apparently typical with seedlings which are sprayed only with Bordeaux mixture. Eventually this was the worst of the sprayed plots, but was nevertheless better than the controls.

## Other Treatments.

Both Plot No. 14 ("Bordodust No. 2") and Plot No. 15 ("Blight dust") were severely affected with leaf miner, and were abandoned prior to the termination of the experiment. Nevertheless, prior to that time these treatments were obviously not very effective in controlling the disease.

Practically all the plants in Plot No. 11 (copper sulphide) were killed by the first application of the spray.

## Controls.

By the 5th January the control plots were so definitely inferior to those which had been treated that they could be distinguished from the latter from a distance. Many seedlings were eventually killed. The survivors became severely affected with the disease, and in several cases the lower leaves dried out.

## Conclusions.

The results of this experiment were not very conclusive, since some infection had no doubt occurred prior to its commencement, and since

it was not desirable to artificially inoculate on a property where plants were being grown commercially, the inoculum was not uniformly distributed throughout the plots. On account of the latter some plots probably escaped infection longer than others. Blue mould was comparatively not very severe during the course of this trial.

"Blu-Mold" dust was found to be the best of the dusts tested, but not as good as many of the sprays. Of the latter copper emulsion was the most promising. Bordeaux mixture alone gave better control than anticipated, probably due to this plot escaping infection longer than most others. Once the plants did become infected they collapsed rapidly. "Agral No. 1" was found to be the most effective spreader for Bordeaux mixture, and then linseed oil, white oil, and soap, in that order.

### Second Fungicide Experiment.

The beds for this experiment were planted on 11th December, 1932, but the seed germinated very poorly and they were consequently resown on 25th December. Half of each plot was covered with a mulch of pine sawdust, with the object of ascertaining whether a mulch would elevate the lower leaves and so facilitate the thorough application of fungicides. However, practically no seed germinated where a mulch had not been employed, and that half had to be again resown on 12th January, 1933.

When the seedlings were about two weeks old they were thinned out so that each seedling had at least one square inch of space.

### Fungicides Applied.

The same fungicides were used and were applied to beds with respectively the same numbers as in the first experiment, with the exception of copper sulphide (Plot No. 11), which was replaced by "Shirlan II.B." at the rate of 2 lb. to 40 gallons, together with 0·25 per cent. "Agral No. 1." The active ingredient of this fungicide is salicylanilide, an organic chemical used in the cotton industry. It is reported[9] to have given satisfactory results in 1931 and 1932 in the control of tomato leaf mould (*Cladosporium fulvum*), which is considered one of the most troublesome diseases of tomatoes in England.

An additional fungicide used in this experiment was ammoniacal copper carbonate, plus 0·15 per cent. "Agral No. 1," which was applied to Plot No. 16.

Copper emulsion was prepared with 0·4 per cent. copper sulphate and 2 per cent. potash soft soap in this series.

### Results.

The two sowings of seed referred to above had germinated by the 5th and 17th January respectively, and fungicides were applied shortly after the seedlings appeared. On one occasion, through neglect to cover beds after spraying during hot weather, some injury was caused to several beds.

Wet humid weather with overcast skies was experienced from the 10th to 17th, and was apparently very favourable for the development of the disease, and consequently this experiment was a severe test for the fungicides employed.

By the 17th blue mould was observed in the controls as well as several of the treated plots, and during the following fortnight became well established. At the end of that period only one control plot contained many living plants, and these were severely affected. The remaining nine controls were either devoid of plants or contained only a few diseased seedlings. At this time the seedlings were more than four weeks old.

The experiment terminated a week later on the 7th February. The various fungicides then appeared to have controlled the disease in the following order:—

**1. Plot No. 2.—Bordeaux Mixture 2-1-50 plus 2 per cent. Soft Soap.**

Blue mould was present on some plants, but was not so severe as in other plots. The stand was dense, but the plants were rather stunted.

**2. Plot No. 5.—Bordeaux Mixture 2-1-50 plus 1 per cent. Molasses.**

Blue mould was rather general, but a fair stand of large plants had survived. Some damage had been caused by leaf miner, and spray burn.

**3. Plot No. 1.—Bordeaux Mixture 2-1-50 alone.**

Blue mould was general and plants were definitely stunted and smaller than in other plots. Damage had also been caused by spray burn. A good stand of plants had survived.

4. Plots Nos. 8, 7, and 9.

**Plot No. 8.—Bordeaux Mixture 2-1-50 plus 0·25 per cent. "Agral No. 1."**

A better stand and larger plants occurred in this bed, but the degree of infection by blue mould was much the same as in the other two beds.

**Plot No. 7.—Bordeaux Mixture 2-1-50 plus "Vallo" Benzol Emulsion.**

The final result was a fair stand, but the lower leaves of many of the surviving plants had been damaged by blue mould and leaf miner.

**Plot No. 9.—Copper Soap Emulsion (2 per cent. Soap, 0·4 per cent. Copper Sulphate).**

Blue mould was severe in this bed, but plants were standing up well.

5. Plots Nos. 4 and 3.

**Plot No. 4.—Bordeaux Mixture 2-1-50 plus White Oil.**

A medium stand was obtained, but some injury had been caused by spray burn. The disease appeared later in this than in most plots, but once established developed rapidly.

**Plot No. 3.—Bordeaux Mixture 2-1-50 plus "Vallo" Casein Spreader.**

A medium stand survived in this bed, but plants were dying at the conclusion of the experiment.

**Other Plots.**

Plots 6 and 10 had very few plants left alive, and practically all plants were dead in the other plots, including the controls when the experiment terminated.

### Conclusions.

Copper soap emulsion was not nearly so good in this trial as in the previous one. Considerable difficulty was experienced in successfully preparing this fungicide at the desired concentration, and it was only towards the end of the experiment that a suitable potash soap was obtained for the purpose. Consequently the early applications were not satisfactory, and probably accounted for the poor result obtained.

In this experiment, when blue mould was particularly severe, the various dusts used did not show any promise, and were eliminated from later trials.

Bordeaux mixture alone again gave much better results than were anticipated, and "Agral No. 1," which had been so successful in the previous experiment, did not improve its efficiency on this occasion, although the addition of this spreader gave better results than several other Bordeaux sprays. It is likely that these rather irregular results were the consequence of an uneven distribution of infection, whereby some plots escaped the disease longer than others.

In this series it was found that soft soap and molasses were the two best spreaders tested.

### Third Fungicide Experiment.

On 3rd February, 1933, a bed 56 feet by 3 feet 6 inches was sown in the departmental grounds in the Brisbane Domain, in order to further and more intensively investigate the possibility of controlling blue mould by fungicides. In these experiments the seedlings were artificially inoculated with blue mould.

The object of this series was to ascertain how great a concentration of certain fungicides could safely be applied, and whether two applications a week would give better control than one.

Copper soap emulsion containing 6 per cent. potash soft soap and 1 per cent. copper sulphate was applied weekly and twice weekly. The same fungicide at twice that strength was applied at similar intervals.

Bordeaux mixture (2-1-50) plus 0·25 per cent. "Agral No. 1," and Bordeaux mixture (4-2-50) plus 0·25 per cent. "Agral No. 1" was also applied weekly and twice weekly.

Other plots were sprayed weekly with Bordeaux mixture (2-1-50) alone, and with 1 per cent. molasses as a spreader. A gasworks product known as "Ammon Cent" was also tested.

Every third plot received no treatment and was used as a control. Each plot was 3 feet 6 inches square.

The first signs of germination were observed on 9th February. The beds were kept covered with hessian and the plants produced were consequently small, spindly, and soft. They were readily damaged by fungicides which were at all severe, and were very susceptible to blue mould infection.

The first application of fungicides was made on 21st February, twelve days after germination.

The plants were artificially inoculated two days and four days later. The inoculum was prepared by agitating affected leaves bearing large quantities of spores in a can of water. The spore suspension was

then applied to the seedlings with a watering-can, and the hessian curtains soaked with water to increase the humidity in the vicinity of the seedlings.

### Results.

The first application of copper soap emulsion at double strength killed about 90 per cent. of the seedlings, and very few survived the second application.

Likewise, double-strength Bordeaux mixture caused considerable damage and about half the plants were killed by the first application. Even normal strengths of fungicides in some cases caused damage to the extremely weak seedlings used in this experiment.

Blue mould was observed on 6th March, and the disease developed very rapidly. Ten days later there were practically no living plants remaining in the control plots.

The experiment was completed on the 22nd March, when the seedlings were six weeks old. On this date the plot sprayed twice a week with the weaker strength of copper soap emulsion was the best plot. The same fungicide applied once a week was next best, notwithstanding the fact that in both cases a considerable degree of damage had been caused by spray burning. The plot sprayed with Bordeaux (2-1-50) plus "Agral No. 1" produced the greatest number of plants, but showed a certain amount of blue mould infection.

Most of the seedlings were killed by the double-strength Bordeaux mixture, and those which survived became affected with blue mould.

Blue mould was observed in the plot sprayed with Bordeaux mixture (2-1-50) alone on 16th March. The following day the plants were producing large quantities of spores, and within five days practically all the seedlings had been killed by the disease.

The addition of molasses did not greatly improve Bordeaux mixture on this occasion, and at the termination of the experiment this plot was only slightly better than that sprayed with Bordeaux mixture alone.

No spray damage was caused by "Ammon Cent," but this plot fared just as badly as the controls after the advent of blue mould.

### Conclusions.

The conditions under which the plants were grown in this experiment made the test very rigorous, and demonstrated the considerable fungicidal value of copper soap emulsion. Two applications of fungicides per week gave better control than one. Double-strength Bordeaux mixture and both strengths of copper soap emulsion used were too concentrated and damaged the tender tobacco seedlings used in this experiment.

### Fourth Fungicide Experiment.

On 11th March, 1933, another bed similar to that used in the preceding experiment was sown at the Brisbane Domain. The seed commenced to germinate six days later. On this occasion the lower edge of the storm curtain was raised about 18 inches above the level of the bed. In this way the seedlings were at all times protected from direct sunlight, but were well aerated.

The objects of the experiment were—

(a) To observe the effect of greater concentrations of "Agral No. 1" and soft soap than had previously been used, as spreaders for Bordeaux mixture. For this purpose the concentration of "Agral No. 1" was increased to 0·25 per cent. and that of soft soap to 2 per cent.

(b) To endeavour to obviate the difficulties involved in preparing copper emulsion by adding an additional 0·5 per cent. of soft soap.

(c) To ascertain the importance of the method of application of sprays. For this purpose Bordeaux mixture with "Agral No. 1" was applied only with a rose nozzle, directing the spray stream at right angles to the surface of the bed, and was compared with another plot which was sprayed with the same fungicide applied with a rose nozzle when the plants were small, and with a flat spray applied at an acute angle when the plants were well established.

(d) To observe the effect of thinning out the beds on the efficiency of the fungicides applied. When the seedings were about three weeks old, the selected beds were thinned out so that each plant occupied 4 square inches of bed. Beds treated in this manner included one each sprayed with copper emulsion and Bordeaux mixture with "Agral No. 1" at the usual strengths, as well as a control plot.

(e) To test out a home-made colloidal copper[7] with a 0·4 per cent. copper sulphate content, together with 0·5 per cent. soft soap as a spreader. "Bouisol," a colloidal copper compound, had not been found very satisfactory in the preliminary series, but it seemed desirable to persevere with a fungicide in a fine state of division, and it was considered that home-made colloidal copper might give better results with a greater concentration of copper. Details for the preparation of this spray are given in the article "Additional Recommendations for the Control of Blue Mould of Tobacco," which appears elsewhere in this issue of the "Queensland Agricultural Journal."

Bordeaux mixture (2-1-50) alone and with 1 per cent. molasses, as well as the usual control plots, were included for comparative purposes. Fungicides were applied twice weekly. The beds were artificially inoculated with blue mould on the 25th, 26th, and 27th March, and the disease made its appearance nine days after the first inoculation. The weather was overcast and wet during a considerable portion of the period under review. During the first five days of April, 816 points of rain were recorded. Conditions subsequently were very favourable for the development of blue mould, and during the latter portion of April it was extremely severe.

**Results.**

Practically all the plants in the control beds were killed ten days after blue mould was first observed.

Bordeaux mixture (2-1-50) alone delayed the development of the disease about a week in comparison with the controls, but the majority of plants in this bed were killed within eight days from the time the disease appeared.

The efficiency of Bordeaux mixture was considerably improved by the addition of 1 per cent. molasses. Blue mould was not observed in this plot until fourteen days after it had appeared in the controls. Six days later, when the plants were five weeks old, some were being killed by the disease, but at that time the plot was the second best in the series.

The addition of "Agral No. 1" to Bordeaux mixture delayed the development of blue mould for fourteen days, as in the case of molasses. Within a week after the disease had been observed, however, practically all plants had been killed.

Some spray injury was caused when 0·25 per cent. "Agral No. 1" or 2 per cent. soft soap was added to Bordeaux mixture. The latter furthermore stunted the seedlings and produced an objectionable caking on the surface of the soil.

Bordeaux mixture and "Agral No. 1" sprayed with a rose nozzle was not as effective as when applied with a flat spray. The majority of the seedlings treated in this manner were killed four days after the advent of the disease.

The addition of excess soap (i.e., 2·5 per cent. as compared with 2 per cent.) in the preparation of copper emulsion caused spray injury. On the 24th April the bed sprayed with normal strength copper emulsion had a 70 per cent. stand, whereas only three or four plants were left on that date in the bed sprayed with this fungicide plus excess soap.

Thinning out the plants to one to each four square inches did not increase the efficiency of the sprays applied. On the contrary, beds treated in this manner fared considerably worse than those which were not thinned out. The spores of the causal fungus of the disease would no doubt have been very thoroughly spread throughout the plots during the thinning-out process, and this would to some extent account for the result. Furthermore, owing to low temperatures at this time of the year the seedlings made very slow growth, and consequently were not sufficiently crowded, in beds which were not thinned out, to interfere with the application of fungicides.

Home-made colloidal copper and soft soap was very successful as a fungicide. Plants in this plot were apparently free from infection on 24th April, three weeks after the development of blue mould in the control plots. The plants were, however, rather stunted.

At the conclusion of the experiment the efficiency of the various treatments was estimated to be in the following order:—

1. Colloidal copper plus 0·5 per cent. soft soap.
2. Bordeaux mixture (2-1-50) plus 1 per cent. molasses.
3. Copper emulsion (normal strength).
4. Bordeaux mixture (2-1-50) plus 0·5 per cent. soft soap.
5. Bordeaux mixture (2-1-50) plus 0·2 per cent. "Agral No. 1."

During the latter part of this experiment the weather was cool and the plants consequently ceased growing. It was, therefore, decided to postpone any further spraying experiments until the spring months.

### Conclusions.

These experiments confirmed the view that the manner in which the fungicides are applied is of considerable importance. Greater concentrations of soft soap or "Agral No. 1" than had previously been used as spreaders were found to be not advantageous. Furthermore it was apparently not advisable to increase the percentage of soap in copper emulsion if the plants were at all delicate.

The most important result of this series was the indication that home-made colloidal copper was a promising fungicide for the control of blue mould. From the practical point of view this was of considerable interest, because this fungicide could be easily and cheaply prepared, and was convenient to use.

### Fifth Fungicide Experiment.

The seed-bed for this experiment was sown on 15th August, 1933. Even then the weather was cool and the seed did not commence to germinate until seventeen days later. It was difficult to arrange for the seedlings to be properly "hardened off" during these experiments, but on this occasion it was found possible to expose the plants to direct sunlight for three hours in the morning and for two hours in the afternoon.

The objects of this experiment were:—

1. To further investigate the possibilities of home-made colloidal copper at the same concentration as used previously, since this fungicide was very promising in the fourth experiment.

   (*a*) The fungicidal values of old and freshly prepared stock solutions of colloidal copper were compared. The former was prepared six weeks prior to the first applications of fungicides in this series, and the latter was three days old when each application was made.

   (*b*) A comparison was made of Bordeaux mixture (2-1-50) and colloidal copper with the addition of three spreaders, viz., "Agral No. 1," "Actin," and soft soap. "Actin" was a new proprietary spreading agent which had only recently been made available. The stock solution for the colloidal copper was six weeks old.

2. To investigate the value of copper emulsion at half the usual strength (i.e., 0·2 per cent. copper sulphate and 1 per cent. soap), in order to obviate caking the soil surface which had been previously experienced with the fungicide at the normal strength. Bordeaux mixture (2-1-50), both with 1 per cent. molasses and without a spreader, were included for comparative purposes.

The fungicides were applied every four or five days, and the first application was made on the 6th September.

The beds were artificially inoculated on 13th and 14th September. During the experiment the weather was overcast or showery and humid, for the greater part, especially subsequent to the 24th September, and was ideal for the development of blue mould.

### Results.

Blue mould was observed in the control beds on 23rd September, and on the 25th they were severely affected. The weather at this time was very favourable for the disease and within twenty-four hours a third of the plants were dead and collapsed. Seven days later there were no living plants in the control beds.

All the sprayed plots were observed to be affected on 26th September. Shortly afterwards the copper emulsion plots appeared to be best, the colloidal copper plots second, and the Bordeaux mixture were not quite so good. This order was not maintained throughout the experiment.

In order to roughly estimate the relative values of the various treatments, all plants were removed in a strip three inches wide running diagonally across each bed, when the plants were six weeks old, and a count was made of all healthy plants so removed. The counts from the best six beds were as follows:—

Colloidal copper and "Actin" yielded 87 healthy plants.

Copper emulsion (normal strength) yielded 78 healthy plants.

Copper emulsion (half strength) yielded 64 healthy plants.

Bordeaux mixture and "Agral No. 1" yielded 62 healthy plants.

Bordeaux mixture and "Actin" yielded 59 healthy plants.

Colloidal copper and soap yielded 49 healthy plants.

The final inspection was made when the plants were seven weeks old, and at that time they were placed in the following order:—

1. Bordeaux mixture (2-1-50) and "Agral No. 1."
2. Colloidal copper and soft soap.
3. Colloidal copper and "Actin."
4. Bordeaux mixture (2-1-50) and "Actin."
5. Copper emulsion (full strength).

The other plots then had either no plants or very few living plants left.

This alteration of the relative condition of the various plots was not uncommon during the course of these experiments. It is of interest, furthermore, to note that some weeks after spraying had ceased there were many more plants surviving in the plot sprayed with colloidal copper and soap than in any other plot.

### Conclusions.

It was found that colloidal copper spray prepared from stock which was at least six weeks old gave better results throughout the experiment than that made from a freshly prepared stock. It was, however, considerably improved by the addition of a spreader.

Bordeaux mixture and "Agral No. 1" was the best plot in the series at the end of the experiment, and was much better than colloidal copper with the same spreader. This result is not in agreement with other comparisons made in this series with these two fungicides. A

possible explanation is that the colloidal copper bed had suffered more than the other plots from the excessive wet weather, which saturated the soil for several days.

Colloidal copper and "Actin" gave better results than Bordeaux mixture and "Actin."

Colloidal copper and soft soap proved superior to Bordeaux mixture with the same spreader. The former did not cause any stunting such as was observed in the previous experiment. It was considered the second best plot when the final observations were made, whereas very few plants were left alive in the plot treated with Bordeaux mixture and soft soap.

Half strength copper emulsion caused considerably less caking of the soil than the same fungicide used at full strength, but as a fungicide it was considerably inferior to the latter.

The copper emulsions were very disappointing at the latter part of this experiment. Until the plants were a little more than a month old, the full strength copper emulsion was the best plot, and the half strength the fifth best. Later, however, as indicated above, they were inferior to several other treatments. Full strength copper emulsion had not previously been found inferior to Bordeaux and "Agral No. 1." The contradictory result on this occasion may have been due to the uneven distribution of the inoculum, since the controls in the vicinity of the former were more severely affected than those in the vicinity of the latter.

The same explanation is probably applicable in comparing Bordeaux mixture alone and the same fungicide plus molasses. The latter was throughout this experiment the worst of the treated plots, whereas previous experiments had indicated that molasses would appreciably improve the efficiency of Bordeaux mixture.

## Sixth Fungicide Experiment.

The beds were sown on 5th October, 1933, in this experiment, and the first signs of germination were noted ten days later.

The objects of this series were:—

(1) To further investigate the fungicidal value of home-made colloidal copper by comparing beds sprayed with this fungicide with others sprayed with Bordeaux mixture. Colloidal copper (copper content equivalent to 0·4 per cent. copper sulphate) and Bordeaux mixture (2-1-50) used alone, as well as the same fungicides with 0·2 per cent. "Agral No. 1" and with 0·5 per cent. soft soap as spreaders, were employed.

(2) To further test the fungicidal value of colloidal copper and "Actin."

(3) Since half strength copper emulsion had not caused any appreciable caking of the soil but was unsatisfactory as a fungicide in the last experiment, copper emulsion was now tried at three-quarters strength (0·3 per cent. copper sulphate and 1·875 per cent. soft soap), and was compared with normal strength copper emulsion.

(4) To test two proprietary fungicides, viz., "Kwik-Kure" Bordeaux and "Shell Anti-Mildew Spray." The latter was a white oil preparation.

The fungicides were applied twice weekly, and the first application was made on 17th October. The beds were artificially inoculated on the 23rd and 24th October.

During the period of this experiment, the weather conditions were even more favourable for blue mould infection than during the fifth experiment. For the greater part of the time it was either raining or overcast. The soil of the seed-beds was saturated and the ground in the vicinity was partly under water.

## Results.

Blue mould was fairly generally distributed throughout the seed-bed on 31st October, sixteen days after the commencement of the experiment. The inoculum had apparently been unevenly distributed, since at this time the plants in one control seed-bed, which were very small and consequently difficult to examine, were apparently healthy, whereas those in the other four control plots were affected. The majority of plants in the latter were flaccid as a result of blue mould infection, and some had been killed. By 7th November half the seedlings in the control plots were dead, and during the next three days practically all were destroyed.

The majority of the sprayed plots were seen to be affected with blue mould when the disease was first observed in the controls. On this occasion, owing to the very rigorous conditions under which the experiment was carried out, the Bordeaux mixture sprays were not very effective in controlling the disease. Colloidal copper and copper emulsion, however, were both comparatively good.

When the plants were four and a-half weeks old, the relative efficiency of the various fungicides appeared to be as follows:—

1. Colloidal copper and soft soap.
2. Colloidal copper and "Agral No. 1."
3. Copper emulsion (full strength).
4. Colloidal copper alone.
5. Colloidal copper and "Actin."
   Copper emulsion (three-quarters strength).
6. Bordeaux mixture and "Agral No. 1."
7. "Shell Anti-Mildew Spray."

Seedlings in the other plots had been destroyed by blue mould.

Upon the completion of the experiment on 14th November, blue mould was present to some extent in every plot. With the exception of one of the colloidal copper and soap plots, in which only a few leaves were killed, some plants had been destroyed by the disease in

every case. The degree of mortality varied from about 5 per cent. in one colloidal copper and soap plot to 100 per cent. in some Bordeaux mixture plots and in the controls. In the Bordeaux mixture and "Agral No. 1" plot about a dozen plants survived.

### Conclusions.

Home-made colloidal copper with soft soap as a spreader was found to be the most efficient spray used in this experiment. Soft soap was slightly superior to "Agral No. 1" as a spreading agent for this fungicide, and "Actin" was not satisfactory. Normal strength copper emulsion was comparatively satisfactory, but the weaker strength was not. All Bordeaux mixture sprays gave disappointing results on this occasion. "Agral No. 1," however, increased the efficiency of this fungicide to a greater extent than soft soap. The proprietary fungicides tested were not effective in controlling the disease.

### Discussion of the Results Obtained in the Six Experiments.

The results obtained with all the fungicides tested are briefly summarised in the following tables. As has been indicated above, these trials were carried out at various times of the year under variable weather conditions, and the manner in which the plants were raised also varied for the different experiments. In some the seedlings were naturally infected and in others they were artificially inoculated, but even in the latter case it was apparently difficult to evenly distribute the inoculum throughout the bed. Consequently the somewhat contradictory results which at times were obtained with some fungicides may partly be explained by these factors.

The results, however, tend to indicate that—

1. The fungicidal dusts tested were not satisfactory.

2. Bordeaux mixture without a spreading agent was not effective. When seedlings were grown under field conditions, more satisfactory results were obtained by the addition of either "Agral No. 1," soft soap, or molasses. In the more rigorous tests fair results were sometimes obtained with these spreaders or with "Actin." "Agral No. 1" was the most efficient spreader tested with this fungicide.

3. Copper emulsion gave variable results, but when used at the normal strength was fairly good.

4. Home-made colloidal copper with soft soap was consistently good, and was the most promising fungicide tested. Unfortunately, however, it was only possible to test it in three experiments. Satisfactory results with it were also obtained at times when "Agral No. 1" or "Actin" was used as a spreader, the former being more efficient than the latter. Colloidal copper was not very satisfactory when used without the addition of a spreading agent, but even so was slightly better than Bordeaux mixture.

## TABLE I.

### Summary of Results of Trials with Fungicides for Control of Blue Mould of Tobacco.

(*N.B.*—Notes on environmental conditions when fungicides were applied, and manner of infection appear at foot of table.)

| Fungicide. | Experiment. | Days after first spraying when disease observed. | Age of Seedlings when disease observed. | Degree of Control. | Remarks. |
|---|---|---|---|---|---|
| "Fungicidal dust" .. | 1 | 21 | Days. 35 | Poor .. | Gave better control than Bordeaux mixture alone, but not as good as other dusts tested. |
| Ditto .. .. | 2 | 12 (fairly severe) | 12 | ditto | Practically all plants dead when experiment terminated. |
| "Blu-mold" dust .. | 1 | 21 | 35 | Fair .. | Best of dusts and better than some Bordeaux sprays. Checked development of disease to some extent. |
| Ditto .. .. | 2 | 14 | 14 | Poor .. | Practically all plants dead when experiment terminated. |
| "Bordo-dust" .. | 1 | 21 | 35 | ditto | Slightly better than Fungicidal dust. Plot abandoned after 32 days in consequence of severe leaf miner damage. |
| Ditto .. .. | 2 | 14 to 21 | 14 to 21 | ditto | Practically all plants dead when experiment terminated. |
| "Blight dust" .. | 1 | 21 | 35 | ditto | Leaf miner so severe as to make observations uncertain. Plot abandoned after 32 days. |
| Ditto .. .. | 2 | .. | .. | ditto | No plants in plot 14 days after germination. Time of infection not observed. |
| Copper sulphide .. | 1 | .. | .. | .. | Complete failure. Plants killed by spray. |
| Ammoniacal copper carbonate + 0·15 per cent. "Agral No. 1" | 2 | .. | .. | Poor .. | No better than dusts in this experiment. No plants in plot 14 days after germination. Time of infection not observed. |
| 0·5 per cent. "Shirlan HB" + 0·25 per cent. "Agral No. 1" | 2 | 12 (well established) | 12 | ditto | No better than dusts in this experiment. Applied weekly. Normal conditions for growth. Weather favourable for disease. |
| "Shell Anti-mildew spray" | 6 | 21 | 23 | ditto | Disease observed in adjoining control plot four days previously. Plants in sprayed plot very stunted as result of spray injury. The smallness of seedlings made observations difficult, and the disease may have been present before being observed. |
| 0·5 per cent. "Bouisol" + 0·5 per cent. soap | 1 | 21 | 35 | Fair .. | Plants well developed. Controlled disease better than Bordeaux mixture alone or with some spreaders. Good spreading quality. |
| Ditto .. .. | 2 | 12 | 12 | Fair .. | Disease well established when experiment terminated. |
| Ammon cent. .. .. | 3 | 20 | 32 | Nil .. | Applied weekly. Spray did not spread well. |
| Bordeaux mixture (2-1-50) alone | 1 | 27 | 41 | Poor .. | Plants became severely affected within five days after disease observed. Finally worst plot. Controls affected six days after experiment commenced. |
| Ditto .. .. | 2 | 26 | 26 | Fair .. | Third best of Bordeaux sprays. Controls well affected twelve days after experiment commenced. Plants stunted and some spray injury. |
| Ditto .. .. | 3 | 20 | 32 | Poor .. | Applied weekly. Practically all seedlings killed by disease within week after observed. |
| Ditto .. .. | 4 | 24 | 24 | ditto | 95 per cent. of plants killed within week and all dead within ten days from time when disease observed. |
| Ditto .. .. | 5 | 19 | 25 | ditto | Very few plants left at end of experiment, but better than some Bordeaux sprays with spreaders. (?)Uneven distribution of inoculum. Thirty-eight plants from strip. |
| Ditto .. .. | 6 | 14 | 16 | ditto | Slightly better than "Kwik-Kure" Bordeaux mixture. |

TABLE I.—*continued.*

**Summary of Results of Trial with Fungicides for Control of Blue Mould Tobacco**—*continued.*

| Fungicide. | Experiment. | Days after first spraying when disease observed. | Age of Seedlings when disease observed. | Degree of Control. | Remarks. |
|---|---|---|---|---|---|
| | | | Days. | | |
| "Kwik-Kure" Bordeaux mixture | 6 | 14 | 16 | Poor .. | Plants were severely affected when disease was first observed. Worst plot in experiment. |
| Bordeaux mixture (2-1-50) + "Vallo" improved spreader | 1 | 21 | 35 | ditto | Checked development of disease better than Bordeaux mixture alone. Spray spread well. |
| Ditto .. .. | 2 | 12 | 12 | Fair .. | Weather favourable for disease. Plants dying when experiment terminated. Plot affected as soon as controls. |
| Bordeaux mixture (2-1-50) + 1 per cent. "Shell White Oil" | 1 | 21 | 35 | ditto | Fair spreading qualities. Fungicide not as good as Bordeaux mixture and soap. |
| Ditto .. .. | 2 | 26 | 26 | ditto | Disease developed rapidly once established. Some spray injury. |
| Bordeaux mixture (2-1-50) + 1 per cent. molasses | 1 | 21 | 35 | ditto | Fair spreading qualities. Checked development of disease after it was rather well established. |
| Ditto .. .. | 2 | 26 | 26 | Good .. | Second best plot in experiment. Some spray injury |
| Ditto .. .. | 3 | 20 | 32 | Poor .. | Applied weekly. Plants declined rapidly; most died in three days after disease established. Nevertheless checked disease development more than Bordeaux alone. Less spray injury than in other plots. |
| Ditto .. .. | 4 | 32 | 32 | Good .. | Best of Bordeaux sprays, but plants were rapidly dying when experiment terminated. |
| Ditto .. .. | 5 | 18 | 24 | Poor .. | No plants left at end of experiment. Worst of treated plots throughout experiment. Not as good as Bordeaux alone. (?)Uneven distribution of inoculum. |
| Bordeaux mixture (2-1-50) and 0·5 per cent. linseed oil | 1 | 21 | 31 | Fair .. | Poor spreading quality. Oil difficult to emulsify. Gave slightly better results than most Bordeaux sprays. |
| Ditto .. .. | 2 | 19 | 19 | Nil .. | A poor stand of plants in this bed throughout experiment and finally no better than controls. |
| Bordeaux mixture (2-1-50) and 1 per cent. benzol emulsion | 1 | 27 | 41 | Fair .. | Spread fairly well. |
| Ditto .. .. | 2 | 12 | 12 | ditto | Better results than obtained with Bordeaux and white oil. |
| Bordeaux mixture (2-1-50) and 0·25 per cent. "Agral No. 1" | 1 | 27 | 41 | Good .. | Most efficient spreader tested. Best of Bordeaux sprays and second best in experiment. |
| Ditto .. .. | 2 | 12 | 12 | Fair .. | Some damage caused by leaf miner. |
| Ditto .. .. | 3 | 20 | 32 | Poor .. | Applied weekly. Only few plants left at end of experiment. Not as good as when applied twice weekly. |
| Ditto .. .. | 3 | 20 | 32 | Good .. | Applied twice weekly. One of the best plots. Produced most plants, but more disease in this plot than in some others. |
| Ditto .. .. | 4 | 32 | 32 | Fair .. | More spray injury than when 0·2 per cent. "Agral No. 1" used. |
| Bordeaux mixture (2-1-50) and 0·2 per cent. "Agral No. 1" | 4 | 32 | 32 | ditto | Degree of control not affected by lower concentration of "Agral No. 1." |
| Ditto .. .. | 4 | 32 | 32 | Poor .. | Plants spaced 1 to 4 sq. in. Practically no plants left at end of experiment. |
| Ditto .. .. | 4 | 32 | 32 | ditto | Sprayed only with mist spray. Plants collapsed in three days after disease established. |
| Ditto .. .. | 5 | 19 | 25 | Good .. | Plants not properly hardened off. Best plot. Relative position improved during latter portion of trial. Sixty-two plants from strip. |
| Ditto .. .. | 6 | 14 | 16 | Poor .. | Best of Bordeaux mixture plots. "Agral No. 1" superior to soft soap in this experiment. |

TABLE I—*continued.*

**Summary of Results of Trials with Fungicides for Control of Blue Mould of Tobacco**—*continued.*

| Fungicide. | Experiment. | Days after first spraying when disease observed. | Age of Seedlings when disease observed. | Degree of Control. | Remarks. |
|---|---|---|---|---|---|
| | | | Days. | | |
| Bordeaux mixture (2-1-50) and 0·025 per "Actin" | 5 | 19 | 25 | Fair .. | Spread well. Result not as good as with colloidal copper and "Actin." Fifty-nine plants from strip. |
| Bordeaux mixture (4-2-50) and 0·25 per cent. "Agral No. 1" | 3 | 20 | 32 | .. | Two applications per week. Severe spray burning. Practically no plants left after seventh application. |
| Ditto .. .. | 3 | 20 | 32 | Fair .. | Applied weekly. Severe spray injury and few plants left when trial terminated. |
| Bordeaux mixture (2-1-50) and 2 per cent. soap | 1 | 21 | 35 | ditto | Spread well. Checked disease better than Bordeaux alone. |
| Ditto .. .. | 2 | 12 | 12 | Good .. | Best plot in experiment. Plants rather stunted. Natural infection. |
| Ditto .. .. | 4 | 32 | 32 | Fair .. | Growth of seedlings adversely affected and soil caked by soap. |
| Bordeaux mixture (2-1-50) and 0·5 per soap | 4 | 32 | 32 | ditto | Final result better than when 2 per cent soap used. Many plants being killed at termination of experiment. |
| Ditto .. .. | 5 | 19 | 25 | Poor .. | Not as good as Bordeaux alone, and few plants left at termination of experiment. Sixteen plants from strip. |
| Ditto .. .. | 6 | 14 | 16 | ditto | Soft soap slightly increased the efficiency of Bordeaux mixture. |
| Copper emulsion, 0·8 per cent.—4 per cent. | 1 | 32 | 45 | Good .. | Spreading qualities good. Gave best control. Soap unsatisfactory and CuSO4 content reduced by half after fourth application. Plants stunted, foliage coarsened and burnt. Infection slight. |
| Copper emulsion, 0·4 per cent. to 2 per cent. | 2 | 12 | 12 | Fair .. | Plants well developed. |
| Ditto .. .. | 4 | 32 | 32 | Good .. | Comparable with Bordeaux and molasses in this experiment. |
| Ditto .. .. | 4 | 32 | 32 | Poor .. | Plants spaced 1 per 4 sq. in. Few plants left at end of experiment, but better results than with Bordeaux and "Agral No. 1" plot treated in same manner. |
| Copper emulsion, 0·4 per cent.-2·5 per cent. | 4 | 32 | 32 | ditto | Only three or four plants survived. Damage mostly caused by spray injury. |
| Ditto .. .. | 5 | 19 | 25 | Fair .. | Was best plot, but deteriorated during latter fortnight of trial. Seventy-eight plants from strip. |
| Ditto .. .. | 6 | 14 | 15 | Good .. | Better than colloidal copper when no spreader was added to latter. |
| Copper emulsion, 1 per cent.-6 per cent. | 3 | 29 | 41 | (?) Good | Two applications per week. Almost a plants had been killed by spray before disease developed in other sprayed plots. Very few survivors affected with disease. |
| Ditto .. .. | 3 | 27 | 39 | (?) Good | Weekly applications. Few plants left as result of spray injury, but relatively good control of disease. |
| Copper emulsion, 2 per cent.-12 per cent. | 3 | .. | .. | .. | Practically all plants killed by spray after second application. Weekly applications. |
| Ditto .. .. | 3 | .. | .. | .. | Two sprayings per week. Practically all plants killed by second application. |
| Copper emulsion, 0·2 per cent.-1 per cent. | 5 | 19 | 25 | Poor .. | Not as good as normal concentration. Less caking of soil. .. |
| Copper emulsion, 0·3 per cent.-1·875 per cent. | 6 | 14 | 16 | Fair .. | Strength not sufficient to protect plants under rigorous conditions. |
| Home-made colloidal copper and 0·5 per cent. soap | 4 | Free of disease at end of experiment | | Good .. | Best plot. Plants very stunted. |
| Ditto .. .. | 5 | 19 | 25 | ditto | Second best plot. Superior to all other plots subsequent to termination of experiment. Well developed plants. Forty-nine plants from strip. |

TABLE I.—*continued.*

**Summary of Results of Trials with Fungicides for Control of Blue Mould of Tobacco**—*continued*

| Fungicide. | Experiment. | Days after first spraying when disease observed. | Age of Seedlings when disease observed. | Degree of Control. | Remarks. |
|---|---|---|---|---|---|
| | | | Days. | | |
| Ditto .. | A. | 24 | 26 | Good .. | Best plot in experiment. Some plants not affected and none killed at termination of experiment. Infection not so severe at the end of bed where this plot was located. |
| | B | 15 | 17 | ditto | Some plants were healthy and only about 5 per cent. were killed at conclusion of trial. |
| Colloidal copper and 0·2 per cent. "Agral No. 1" | 5 | 19 | 25 | Poor .. | Not as good as Bordeaux and "Agral No. 1." Few plants left when experiment terminated. Forty-one plants from strip. |
| Ditto .. .. | 6 | 15 | 17 | Good .. | Not quite as good as colloidal copper and soap, but considerably superior to Bordeaux and "Agral No. 1." |
| Colloidal copper and 0·025 per cent. "Actin" | 5 | 19 | 25 | ditto | Amongst best plots and gave highest count of plants from strip (viz. eighty-seven). |
| Ditto .. .. | 6 | 14 | 16 | Fair .. | Comparable with three-quarter strength copper emulsion. "Actin" did not improve the efficiency of fungicide, and was inferior to soap or "Agral No. 1." |
| Colloidal copper (alone) | 5 | 18 | 24 | Poor .. | Made from stock solution *not more than three days old.* Not as good as spray from mature stock solution. Better than Bordeaux alone during experiment. No plants left finally. Twelve plants from strip. |
| Ditto .. .. | 5 | 11 | 25 | ditto | Few plants left at termination of experiment. Thirty-eight plants from strip. |
| Ditto .. .. | 6 | 21 | 23 | Fair .. | Plants were more stunted than those in adjoining plot sprayed with colloidal copper and soap. |

TABLE II.

**Control Plots.**

| Experiment. | Age of Seedlings when Disease Observed. | Remarks. |
|---|---|---|
| | Days. | |
| 1 .. .. .. | 21 | Some plants were killed by blue mould when six weeks old. In most cases only lower leaves were killed. |
| 2 .. .. .. | 12 | Seedlings were severely affected when three weeks old, and majority were dead a week later. Practically no plants survived the period of the experiment. |
| 3 .. .. .. | 26 | Blue mould was observed fourteen days after inoculation and within a week practically all plants were killed by the disease. |
| 4 .. .. .. | 17 | Blue mould was observed nine days after inoculation. Some plants were killed during the following week, and practically all were destroyed within four weeks from date of germination. |
| 5 .. .. .. | 17 | Blue mould was observed ten days after inoculation. During the following forty-eight hours the seedlings became severely affected, and all were dead within nine days from the time the disease was observed. |
| 6 .. .. .. | 15 | Blue mould was observed seven days after inoculation. Within twenty-four hours most plants were severely affected and some were killed. During the subsequent ten days practically all plants were killed. Owing to uneven distribution of inoculum, some plots were destroyed earlier. |

### Explanatory Notes.

The plants in Experiment I. were exposed only to natural infection, and were grown under normal field conditions at Parkridge. All fungicides were applied once a week. Environmental conditions were not so favourable for the disease as in the other experiments.

In the case of Experiment II. the plants were also exposed only to natural infection, and were grown under normal field conditions at Parkridge. All fungicides were applied once a week. Weather conditions during the experiment were very favourable for the development of blue mould.

In Experiments III., IV., V., and VI. the inoculum was applied artificially and the plots were situated in the departmental grounds in the Brisbane Domain.

In Experiment III. the plants were grown under hessian, which was closely attached to the sides of the bed throughout the experiment. Consequently plants were small, spindly, and soft, and predisposed to disease and spray injury. Fungicides were applied at times indicated in the tables.

In Experiment IV. the seed-bed was covered with hessian, the lower edge of which was permanently fixed about 18 inches above the level of the bed. Hence better aeration and more indirect sunlight were obtained than in Experiment III., but conditions nevertheless were more conducive to infection than occur in normal field practice. Sprays were applied twice weekly.

In Experiment V. the seedlings were partially "hardened off" by being exposed to sunlight for about three hours in the forenoon and for two hours in the afternoon. Fungicides were applied every four or five days. All plants in a strip three inches wide running diagonally across each bed were removed when six weeks old and a count was made of all healthy seedlings.

In the case of Experiment VI. the seedlings were grown under similar conditions as in Experiment V. Fungicides were applied every four or five days. The weather was either wet or overcast for the greater portion of the period of the experiment, and during this time the soil of the bed was saturated. Conditions were consequently ideal for blue mould infection.

All plants were removed in a strip running diagonally across each bed when they were six weeks old, and a count was made of all healthy seedlings.

### Field Tests with Copper Emulsion Spray.

It had been found practically impossible at the latter end of 1932 to raise tobacco seedlings at the Parkridge Tobacco Plantations Pty., Ltd., owing to the severity of blue mould in the district.

At the conclusion of the first experiment discussed herein, which was carried out on this property, the manager of the company was so impressed with the results obtained with copper emulsion spray that he used it as a general practice on all seedlings growing on the plantation.

The same method of applying the fungicide was employed as had been used on the experimental plots, and both healthy and diseased seedlings were sprayed. The strength of the fungicide was increased

to the equivalent of 3·1 per cent. soft soap and 0·55 per cent. bluestone. Very small seedlings were sprayed once a week, but rapidly growing seedlings received two or three applications weekly.

Sufficient seedlings were obtained in this manner to supply the need of the company, and eventually forty-eight acres were planted with tobacco. This satisfactory result was not associated with favourable environmental conditions. On the contrary the weather was apparently

PLATE 129.

Seed-beds on Parkridge Tobacco Plantations Pty. Ltd. property planted on same date as that shown in Plate 131 and situated about half a mile distant from it. The seedlings were only slightly affected when transplanted to the field. Sprayed with copper emulsion.

PLATE 130.

A closer view of seedlings shown in Plate 129. Sprayed with copper emulsion.

conducive to blue mould infection, since the control plots of the second preliminary experiment, which were growing on this property at the same time, were completely destroyed.

The City Boundary Estates, another tobacco company in the Parkridge district, also used copper emulsion containing 2 per cent. soft soap and 0·4 per cent. copper sulphate during the 1932-33 season. Blue mould was successfully controlled thereby while the fungicide was regularly applied, and a considerable acreage of tobacco was eventually planted out.

On the 6th September, 1933, five beds 150 feet by 4 feet were planted at the Parkridge Tobacco Plantations Ltd. The seedlings were sprayed with copper emulsion containing 3·1 per cent. soft soap and 0·47 per cent. copper sulphate thirteen days after germination. Subsequent applications were made weekly for the first three weeks and thereafter twice weekly. The seedlings were not thinned out, and the beds were so overcrowded when the plants were six weeks old that the dense stand of plants completely occupied the bed space. The beds were situated on the lowest situation on the property on the border of a swamp.

PLATE 131.

Tobacco seed-bed eleven days after plants had been completely destroyed by blue mould. The only vegetation in bed consisted of weed growth. Not sprayed with copper emulsion.

Notwithstanding the fact that the density of the stand of plants made efficient spraying difficult, and the situation of the beds and the prevailing weather conditions were conducive to the development of blue mould, the disease was satisfactorily controlled. Blue mould was observed in two of the beds when the seedlings were four weeks old. During the following three weeks the disease spread throughout the five beds, but the plants were only slightly affected and none were killed. Several acres of tobacco were eventually planted up from these beds.

A seed-bed was sown on the adjoining farm, situated about half a mile from the abovementioned beds, on approximately the same date, and was dusted with various fungicidal dusts. When the seedlings were

five and a-half weeks old they were observed to be affected with blue mould, and all plants were completely destroyed within twenty-four hours. Plate 131 contrasts the condition of this bed with beds sown on approximately the same date at the Parkridge Tobacco Plantations Ltd. This company also planted eleven other similar beds, six of which were five weeks old and five were two weeks old when inspected on the 8th November. They were also sprayed with copper emulsion, and were apparently free of infection on that date.

A private grower in the Parkridge district also used copper emulsion during 1933 with considerable success. This spray was of normal strength, containing 2 per cent. soft soap and 0·4 per cent. copper sulphate. His beds were inspected on the 8th November. On this date only one bed was affected with blue mould. This bed was 90 feet by 3 feet, and the seedlings were eight weeks old. Blue mould had been observed twelve days prior to the date of inspection, and an area about 4 feet in diameter was affected. All other beds were apparently healthy. One bed about 20 feet by 3 feet contained plants ten weeks old, other beds 27 feet by 4 feet and 45 feet by 3 feet contained plants six weeks and three weeks old respectively.

So far as could be ascertained, practically the only living tobacco seedlings in the Parkridge district on the 8th November were those which had been sprayed with copper emulsion as described above.

## SUMMARY.

Six fungicide experiments for the control of blue mould (*Peronospora tabacina*) of tobacco, which were carried out in the Brisbane district in 1932 and 1933 are discussed.

Tobacco seedlings are difficult to spray efficiently, owing to the fine tomentose covering of the leaves and to the low-lying habit of the young plants, which makes actual contact with the leaf surface difficult.

Hence in these experiments particular attention was given to the use of spreading agents, to fungicides in an extremely fine state of division, and to the manner in which the sprays were applied.

In preliminary trials which were carried out under normal field conditions, several sprays were found superior to dusts. Of the former copper emulsion was the most promising. "Agral No. 1," potash soft soap and molasses were found most suitable as spreading agents for Bordeaux mixture.

In further trials where seedlings were artificially inoculated and were grown under conditions very conducive to the development of blue mould, these results were substantiated.

The most suitable strengths, times of application, and manner of application were investigated.

It was found that home-made colloidal copper with soft soap as a spreader was most suitable as a fungicide for tobacco seedlings.

Copper emulsion was tested more thoroughly than colloidal copper in these experiments, and was also tried out commercially in the Brisbane district. It gave consistently rather satisfactory results, but requires considerable care in preparation.

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# Queensland Tobacco Soils.

By E. H. GURNEY and J. L. F. FORAN.

IT is only during comparatively recent years, owing to the increasing demand for lemon or bright flue-cured tobacco, that the industry, which previously was confined chiefly to the production of dark leaf, has taken on new life.

The incidence of this increased activity is due to the recognition of the fact that acres of land, heretofore looked upon as waste, owing to their poor sandy nature, were of the class that should produce—other factors being favourable—tobacco leaf of the desired commercial quality.

So far varying success has attended the efforts of various growers, and, although the amount of first-class leaf falls far short of requirements, still, the fact that in every district where tobacco has been grown, during some period of the last few years, bright leaf has been cropped has encouraged many of those in the industry to be optimistic in their continued efforts.

The many interdependent factors influencing the production of the desired leaf are outside the scope of this article, since it is devoted mainly to a description of the tobacco-growing areas of Queensland. Soils of other parts of Australia have already appeared in other publications (1·2) and it is thought desirable that those of this State should be so recorded.

## Distribution of Tobacco Soils.

Tobacco soils in Queensland are widely distributed over the eastern coastal belt of the State in certain well-defined divisions. In the northern section are the red soils of the Laura district, with those of Mareeba and Chewko a little further south. To the latter have recently been added a good deal of hitherto unoccupied country around Dimbulah. Again good tobacco has been grown at Hervey's Range, where a fair amount of initial experimental work was previously carried out, and at Charters Towers.

In the Central district marketable leaf has been produced in the Bowen and Mackay (Sarina) districts. A little tobacco is being grown around Rockhampton—at Yeppoon—and further South the industry has been established at Miriam Vale and Bundaberg. At Stanthorpe and Inglewood and Texas in the south-eastern part of Queensland a certain amount of success has been achieved, whilst the latest addition —the Beerburrum Settlement—has contributed its first quota. Consequently it is seen that there is a very extensive range of districts, from tropical to warm temperate, where tobacco may be grown, and as a great deal depends on climatic influence, for the production of bright leaf it will be appreciated that an intelligent study of the soil may be the means of mitigating any undue influences due to extreme variations of such climate.

## Description of Districts—General.

(In the following paragraphs Soils Nos. between 3215 and 3489 appeared in the Annual Report of the Department for 1931 and 1932. Numbers from 3489 to 3632 appear in the Annual Report for 1933).

Laura (Nos. 3408 and 3473)—In this, the most northerly district where tobacco is grown, samples representative of thousands of acres were taken on a superficial survey by departmental officers in 1931. They are typical of poor red and reddish-brown sandstone country. The surface soil is shallow and has a preponderance of coarse sand with an increase in clay content at a depth of two feet six inches, where it is of a deep red colour.

Chewko (Nos. 3215 and 3220)—These soils are in the parish of Tinaroo bounded by the Chillagoe Railway and Nicotine and Narcotic Creeks. The country generally is thickly timbered with gum, tea-tree, and ironwood forest, and is of granite formation. They are poor grey loose sandy soils with grey to greyish white subsoils. In places there are tea-tree swamp areas.

Mareeba (Nos. 3507-3514)—This district has been looked upon as typical for bright tobacco production. There are three types considered, all of which are granitically derived—(1) A grey fine sandy alluvial soil containing about 10 per cent. of silt; (2) a red sandy soil; and (3) a white sandy soil. The two latter are much coarser in texture than the former, whilst all three are fairly deep soils with similar subsoils.

Dimbulah (Nos. 3552-3565)—During the last couple of years, much of this area was thrown open for the purpose of selection by prospective tobacco growers, with the result that, at present, there are a fair number of lessees in occupation. The area is watered by Walsh River and its tributaries—Horse Creek and Eureka Creek. The soil is of the poor loose sandy class and is timbered with tea-tree and pandanus and quinine, the tea-tree undergrowth being dense in parts. At Horse Creek a light grey sandy soil overlies a greyish white subsoil. Facing the high creek bank the soil is deep. Portion of this area has a hard, somewhat indurated surface. On Eureka Creek the soils are coarse in texture, the subsoils being described as coarse and sandy but containing less gravel and more coarse sand. At Innot Hot Springs the soils are grey in colour and contain very little fine gravel, but are still coarse, the subsoil, of a light-brown colour, being very similar to the surface.

Hervey's Range (Nos. 3296-3297)—The soil at Hervey's Range belongs to elevated country surrounded by rocky ridges, and consists of a fairly coarse grey material with a higher content of silt and clay than those previously mentioned.

The Charters Towers soil and subsoil (No. 3532) is not so coarse and does not contain much of the finer fractions, whilst those of the Bowen district are chiefly coarse sands, one sample (No. 3298) containing 76 per cent. of coarse sand. This is very rugged country, thickly timbered with ironbark, wattle, and bloodwood, and the soils are of granite origin.

Mackay (Nos. 3286, 3287, 3289 to 3291)—About twenty miles south of Mackay in the Sarina district, close to Plane Creek tramway, similar to Chewko as regards their flora and derivation. Around Mount Chelona are brown and greyish brown soils on poor coarse sandy and gravelly ridges. Their subsoils are distinctive in being of a yellow coarse sand.

At Blue Mountain, which is much nearer the coast, the soils and subsoils are similar on the higher land to those of Mount Chelona. This higher ground shallows off on the Alligator Creek side, which consists of dense mangrove swamps.

*Inglewood* (Nos. 3469, 3470, 3487 to 3489).—Fair prices were obtained this year for tobacco from this district—sandy alluvial river flats, with coarser and sandier higher ground. The soil is formed of decomposed granite. The better-class leaf came from the higher area.

*Stanthorpe* (Nos. 3409, 3410, 3478).—The poorer grey sandy soils, exsting in this granite belt, have been devoted in instances to the cultivation of tobacco. They are of a finer texture in the vicinity of Amiens than at Stanthorpe.

*Beerburrum.*—The soils here quoted are from an experimental plot on virgin land and are of fine sandy to sandy texture.

*Texas.*—So far the sandy soils of the district have not been through the laboratory.

### Chemical Analyses.

All samples of tobacco soils were subjected to chemical examination, and the results of some of these analyses have already appeared in the Annual Reports of the Department of Agriculture of 1931 and 1932, the balance being recorded this year. Although soils suitable for bright leaf tobacco are not considered from a chemical standpoint, as soils of low plant-food content are chosen for the production of bright leaf tobacco in order that the required kind and quantity of plant foods may be supplied by the application of fertilizers, still a few notes may be of interest. A study of the results show that the analyses are typical of poor sandy country. For a sandy soil to be said to contain a "fair" amount of humus, such humus content should at least be 1·5 per cent. On analysis average figures for soil dried at 100 deg. C. may be given as follows:

| — | Humus. | Other Organic Matter and Combined with Water. |
|---|---|---|
| | Per cent. | Per cent. |
| Laura | ·30 | ·84 |
| Mareeba district | ·57 | 1·17 |
| Hervey's Range | 1·21 | 2·01 |
| Charters Towers | ·81 | 1·28 |
| Bowen | ·94 | 1·97 |
| Mackay | ·79 | ·90 |
| Miriam Vale | ·64 | 1·35 |
| Bundaberg | 1·21 | 1·21 |
| Inglewood | 1·17 | 2·54 |
| Stanthorpe | 1·01 | 1·40 |
| Beerburrum | 1·28 | 2·42 |

Consequently, it is worth noting that all Queensland tobacco soils are deficient in this important constituent, with the exception, perhaps, of those individual soils at the Delta, Bowen (No. 3524), Inglewood (No. 3469), and Beerburrum (No. 3608). The latter is virgin land. Again, it is not desirable that the iron content be high. In the majority of cases the percentage of iron and alumina combined falls below 3 per cent., but at Bowen and Inglewood, in places, it reaches 10 per cent., whilst the highest recorded percentage was at Mount Chelona, in the Sarina district—19·0 per cent.

It should be sufficient to add that the amount of material insoluble in hydrochloric acid (sp. gr. 1·1) very seldom falls below 95 per cent. and in many cases reaches 98 per cent., an indication that the soils in question should be classified as straight-out sands, with the usual very low content of mineral plant foods.

### Soil Reaction.

The hydrogen ion concentration of the soils was determined by the quinhydrone electrode (1:2 water suspension) except in a few of the earlier cases where the Truog test was applied.

Recourse had to be had to the antimony electrode for some soils fronting Walsh River and Eureka Creek (Nos. 3260-3263). All the soils in the Laura, Chewko, Mareeba, and Dimbulah areas were on the average slightly acid (pH 6·64: subsoil pH 6·46) with the exception of those at Innot Hot Springs, where they were more acid (pH 5·81). At Hervey's Range and in the Sarina district, the acidity is more pronounced (pH 5·3 to 5·5 both soil and subsoil). Beerburrum soils also fall in this region of acidity (pH 5·2). The Charters Towers soil has a pH 6.45 with subsoil similar. The soils of the Inglewood district are in the neutral range, while those of the Amiens district, according to the Truog test, were of medium acidity (equivalent to about pH 5·0 to 5·5) as against Stanthorpe (pH 6·6, subsoil pH 5·8).

### Physical Properties.

*Soil Colour.*—The predominent colours of these sandy tobacco soils are grey and light brown, the subsoils being brown, white, and yellow, or principally combinations of these several colours.

*Water Capacity.*—The capacity for absorbing water is more pronounced in the lighter type of soils such as at Inglewood, the grey alluvial soils of Mareeba, Bowen (No. 3524), Hervey's Range, and Beerburrum. This is due in most cases to the higher content of humus. These soils are capable of absorbing as much water again as the coarser sandy soils, and about half as much again as the ordinary sandy soils. This is a matter of importance when rainfall may not be as regular as required for the growing crop.

*Capillarity.*—The capillary power for water of these soils is typical of all sandy soils, with the exception of a sample from Laura taken to a depth of 2 feet 6 inches. In this case the maximum capillary rise in the soil column was only 5½ inches, reached after three hours. No further increase in height was obtained; which may be attributable to the fine sand fraction containing particles, most of which approach the upper limit of the fine silt fraction. As it is the soil contains ten times as much clay as the sample from 1 foot depth.

### Mechanical Analyses.

In a previous paragraph a general description of the Queensland tobacco soils has been given based on the analyses of all soils received at the laboratory for advice as to suitability for tobacco growing, and a reference quoted as to where the results of such analyses can be found. In the following table is present representative analyses of such soils

and subsoils on the International basis—i.e., coarse sand, fine sand, silt, and clay:—

TABLE OF MECHANICAL ANALYSES OF SOILS.

| Soil No. | District. | Classification. | Coarse Sand. 2·0—0·2 m.m. | Fine Sand. 0·2—0·02 m.m. | Silt. 0·02—0·002 m.m. | Clay. Less than ·002 m.m. | Graph. | Diagram. |
|---|---|---|---|---|---|---|---|---|
| | | | % | % | % | % | | |
| 3215 | Chewko, Average 6 .. .. | gr. c.s.s. .. | 64·5 | 27·2 | 3·2 | 2·1 | 1 | 1 |
| to 3220 | Chewko, Subsoils .. .. | yl. br. c.s.s. .. | 61·0 | 26·6 | 4·4 | 4·5 | 1 | Similar to 1 |
| 3408 | Laura, 0″–8″ .. .. .. | br. f.s.s. .. | 38·0 | 54·9 | 2·2 | 1·9 | 2 | 2 |
| .. | Laura, Subsoil .. .. .. | r. br. f.s.s. .. | 39·5 | 42·9 | 3·1 | 2·0 | 2 | Similar to 2 |
| 3473 | Laura, 0″–30″ .. .. .. | r. f.s.s. .. | 31·0 | 52·2 | 4·1 | 11·7 | 2 | 3 |
| 3509 | Mareeba .. .. .. | gr. f.s.s. .. | 7·7 | 66·3 | 11·3 | 6·2 | 3 | 4 |
| 3510 | Mareeba .. .. .. | gr. f.s.s. .. | 14·0 | 68·0 | 10·5 | 5·5 | 3 | 5 |
| 3511 | Mareeba .. .. .. | r. c.s.s. .. | 67·0 | 24·0 | 3·3 | 2·2 | 3 | Similar to 1 |
| 3514 | Mareeba ... .. .. | wh. c.s.s. .. | 59·0 | 35·0 | 2·8 | 2·2 | 3 | .. |
| 3552 | Dimbulah—Horse Creek .. | lt. gr. f.s.s. .. | 33·5 | 58·0 | 2·0 | 5·0 | 4 | 6 |
| .. | Dimbulah—Horse Creek (subsoil) | br. wh. f.s.s... | 31·4 | 57·6 | 5·5 | 4·0 | 4 | 7 |
| 3554 | Dimbulah—Eureka Creek .. | gr. br. c.s.s. .. | 76·9 | 15·3 | 2·8 | 2·0 | 4 | 8 |
| .. | Dimbulah—Eureka Creek (subsoil) | gr. br. c.s.s. .. | 68·0 | 23·8 | 3·4 | 2·8 | 4 | 9 |
| 3556 | Dimbulah—Innot Hot Springs | gr. c.s.s. .. | 64·7 | 28·5 | 2·7 | 1·3 | 13 | G |
| 3562 | Dimbulah—Eureka Creek .. | br. f.s.s. .. | 37·2 | 52·2 | 6·5 | 3·3 | 13 | H |
| 3564 | Dimbulah .. .. .. | y. br. f.s.s. .. | 30·8 | 56·0 | 3·0 | 2·0 | 5 | A |
| .. | Dimbulah (subsoil) .. .. | y. br. f.s.s. .. | 24·5 | 68·0 | 3·4 | 3·1 | 5 | B |
| 3530 | Hervey's Range .. .. | gr. c.s.s. .. | 67·0 | 17·5 | 8·8 | 6·2 | 6 | C |
| 3532 | Charters Towers .. .. | lt. br. c.s.s. .. | 62·0 | 24·5 | 7·4 | 4·1 | 6 | D |
| 3524 | Bowen—The Delta .. .. | dk. f.s.s. .. | 14·5 | 72·0 | 3·5 | 5·5 | 7 | E |
| 3526 | Bowen—The Delta .. .. | br. f.s.s. .. | 3·8 | 84·4 | 4·1 | 4·3 | 7 | F |
| 3531 | Bowen .. .. .. .. | wh. s.s. .. | 33·5 | 55·3 | 3·8 | 4·4 | 7 | J |
| 3319 | Bowen—Mount Aberdeen .. | lt. br. s.s. .. | 37·3 | 53·7 | 4·8 | 3·0 | 7 | K |
| 3289 | Sarina—Blue Mountain .. | lt. br. f.s.s. .. | 28·6 | 60·9 | 6·0 | 2·3 | 8 | L |
| 3290 | Sarina—Blue Mountain .. | lt. gr. c.s.s. .. | 52·7 | 34·1 | 7·1 | 3·9 | 8 | M |
| 3291 | Sarina—Blue Mountain .. | gr. c.s.s. .. | 54·4 | 37·9 | 5·4 | 2·3 | 8 | Similar to M |
| 3520 | Sarina .. .. .. .. | gr. s.s. .. | 44·8 | 49·2 | 1·0 | 3·0 | 9 | N |
| 3522 | Sarina .. .. .. .. | lt. gr. s.s. .. | 45·4 | 44·9 | 1·0 | 3·2 | 9 | Similar to N |
| 3569 | Sarina .. .. .. .. | r. br. s.s. .. | 42·0 | 49·2 | 3·5 | 2·5 | 15 | O |
| 3288 | Miriam Vale .. .. .. | gr. br. c.s.s. .. | 59·5 | 31·4 | 4·8 | 2·3 | 10 | Similar to K |
| 3542 | Miriam Vale .. .. .. | br. f.s.s. .. | 36·0 | 52·4 | 6·6 | 4·0 | 10 | P |
| 3566 | Yeppoon—Byfield .. .. | gr. wh. f.s.s... | 11·3 | 79·0 | 3·0 | 4·0 | 14 | Q |
| 3470 | Inglewood .. .. .. | yl. br. f.s.l. .. | 25·2 | 46·7 | 15·1 | 8·0 | 11 | R |
| 3488 | Inglewood .. .. .. | lt. br. s.s. .. | 42·0 | 46·0 | 5·8 | 4·2 | 11 | Similar to H |
| 3489 | Inglewood .. .. .. | lt. br. f.s.l. .. | 11·1 | 53·9 | 27·9 | 10·3 | 11 | S |
| 3478 | Stanthorpe .. .. .. | lt. gr. c.s.s. .. | 60·9 | 24·0 | 6·1 | 5·0 | 12 | T |
| 3409 | Stanthorpe .. .. .. | gr. s.s. .. | 39·9 | 46·4 | 5·2 | 3·0 | 12 | U |
| 3536 | Parkridge .. .. .. | gr. br. s.s. .. | 40·5 | 41·7 | 9·8 | 4·0 | 14 | V |
| 3538 | Parkridge .. .. .. | bl. cl. .. | 3·0 | 28·5 | 30·9 | 16·6 | 14 | .. |
| 3411 | Beerburrum .. .. .. | lt. br. c.s.s. .. | 13·8 | 74·2 | 6·0 | 1·0 | 15 | X |
| 3608 | Beerburrum .. .. .. | gr. s.s. .. | 41·9 | 40·5 | 6·0 | 4·0 | 15 | Y |
| | | AMERICAN SOILS. | | | | | | |
| N.C. | Cecil .. .. .. .. | s.l. .. | 32·2 | 35·4 | 23·6 | 8·5 | 16 | (1) |
| N.C. | Durham .. .. .. .. | c.s.l. .. | 43·4 | 31·4 | 19·4 | 5·8 | 16 | (2) |
| N.C. | Durham .. .. .. .. | s.l. .. | 47·1 | 31·4 | 17·9 | 3·8 | 17 | (3) |
| N.C. | Granville .. .. .. | c.s.l. .. | 49·6 | 22·6 | 19·2 | 8·0 | 17 | (4) |
| N.C. | Norfolk .. .. .. .. | c.s.l. .. | 0·8 | 70·0 | 19·0 | 10·3 | 18 | (5) |
| G. | Tifton .. .. .. .. | s.l. .. | 16·3 | 62·8 | 12·0 | 8·2 | 18 | (6) |

These results were obtained after analysis by the British system from which they have been interpolated, by means of the graphs also shown. For purpose of comparison, the analyses of six typical soils from North Caroline and Georgia (America) where first-class bright leaf tobacco is grown, are also given. These latter are extracted from the pamphlet (No. 1) issued by the Australian Tobacco Investigation. It will be noticed that the American soils contain much more silt and clay than those of Queensland.

The following short table will make this clear—approximate percentages only:—

| Soil. | Sands. | Silt and Clay. |
|---|---|---|
| | % | % |
| American .. .. .. .. .. .. .. | 70 to 80 | 30 to 20 |
| Queensland— | | |
| Twenty-four soils .. .. .. .. .. | 90 | 10 |
| Six soils .. .. .. .. .. .. | 85 | 15 |
| One soil .. .. .. .. .. .. | 75 | 25 |
| One soil .. .. .. .. .. .. | 65 | 35 |

The two latter soils, both from Inglewood, approach in mechanical composition, most closely to the American soils quoted.

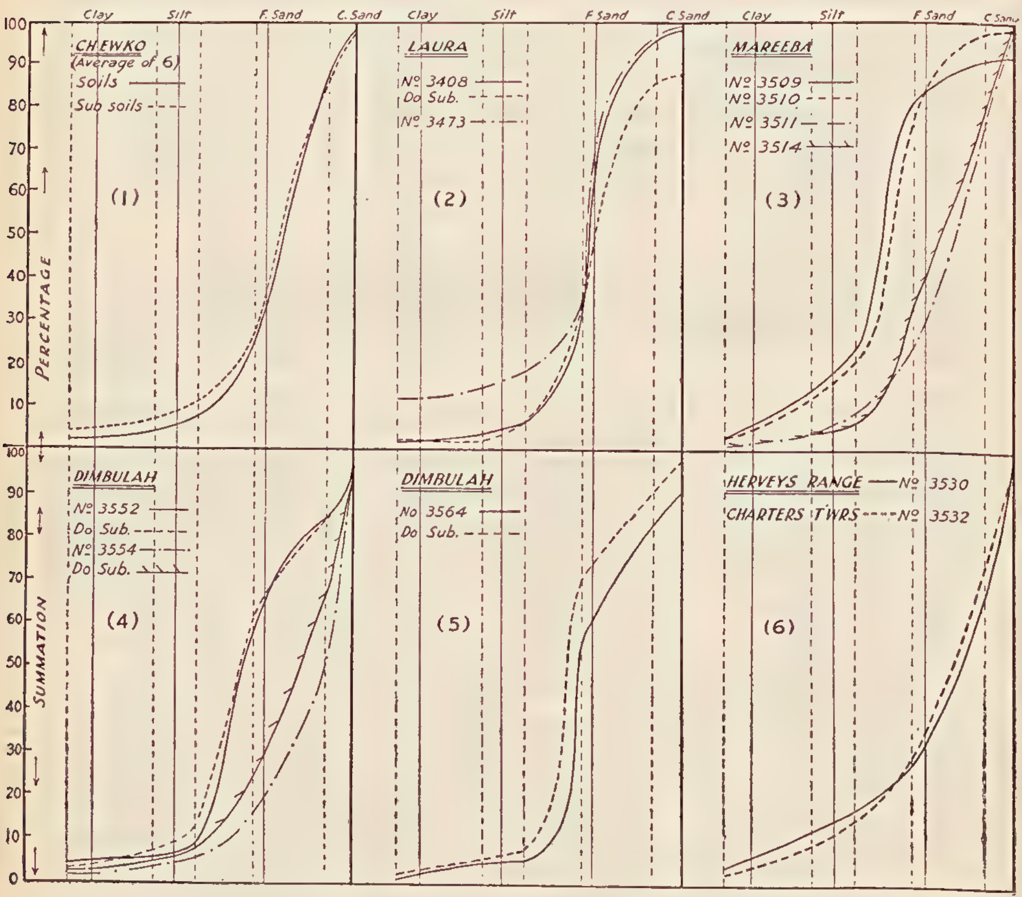


PLATE 132.—GRAPH I.

Graphs I., II., and III. illustrate the mechanical composition of Queensland tobacco soils. Dotted lines represent the limiting settling velocities of the fractions in the British system, and the continuous vertical lines represent the same velocities according to the international system.

## Graphical Illustrations.

These soils are graphically illustrated and present a very striking picture. It will be noticed that the graphs of the American samples fall more to the left than most Queensland soils. A regular sweep of the curve indicates an even gradation of particles, from the largest to the smallest. There are many such regular curves illustrative of the Queensland soils. This even distribution of the soil particles is very important from a cultural point of view as, for instance, it would be the means of assisting in the even initial incorporation of applied fertilizer.

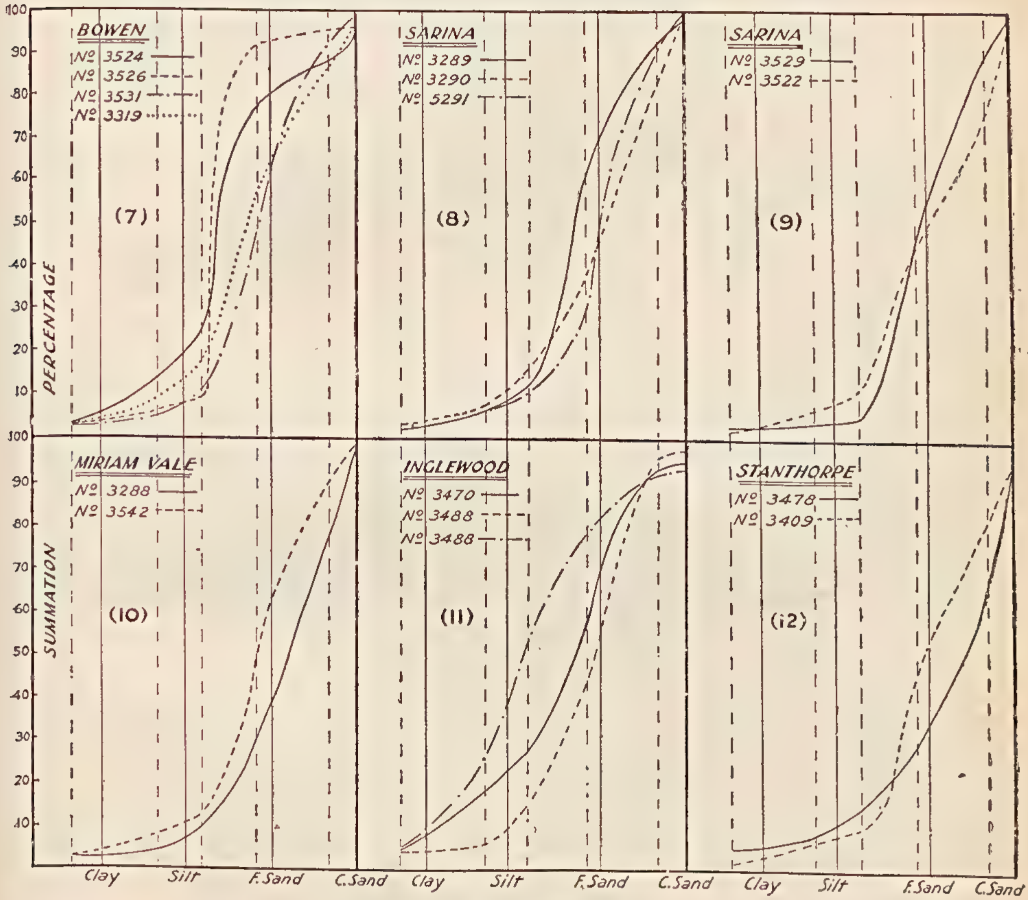


PLATE 133.—GRAPH II.

Further, after interpolation and recalculation to 100 per cent., the mechanical analyses have been reduced to a point in the triangular diagram where it will be noticed that the Queensland soils fall in the section marked *sand,* whereas the typical American soils are in the *sandy loam* division, which comprises also only two Queensland soils, namely, those from Inglewood.

## Conclusion.

Although these soils generally are sands deficient in mineral plant foods and humus, they contain inherent possibilities for the production of bright tobacco, and such possibilities have to be stimulated or nursed to obtain maximum results in the several districts, or, again, within the same district.

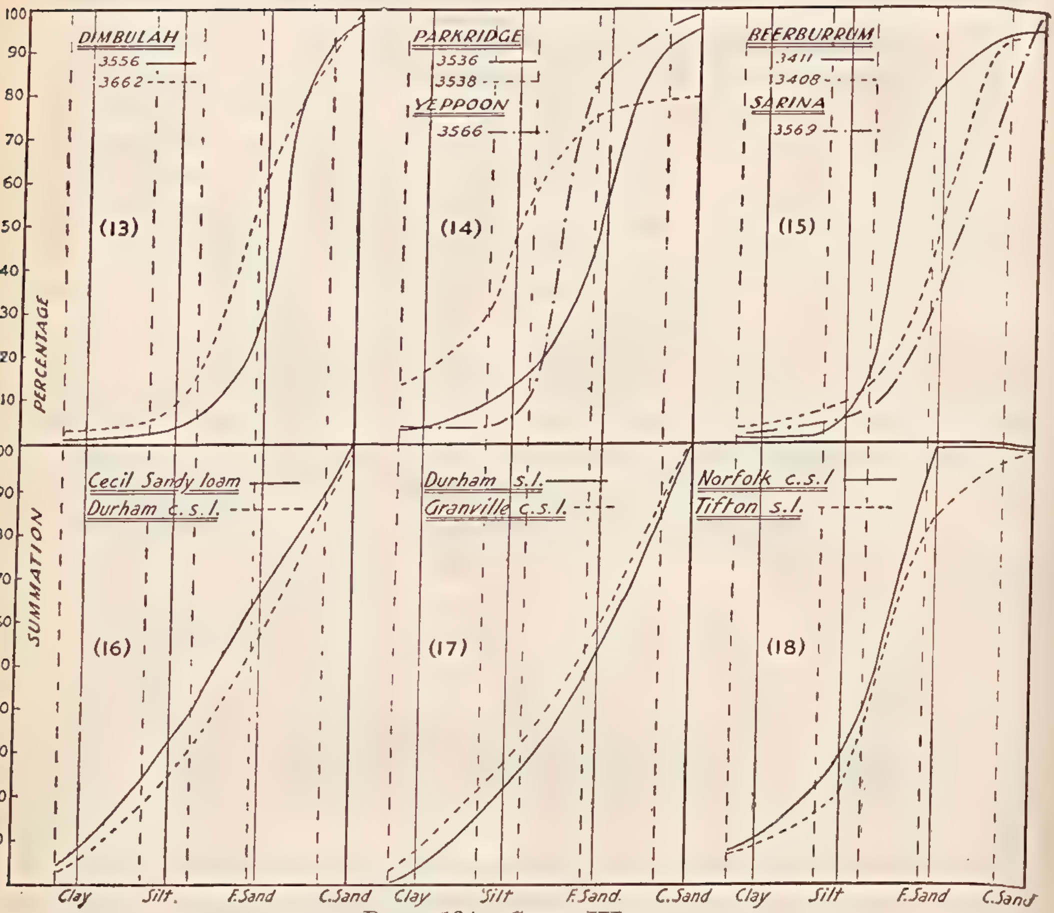


PLATE 134.—GRAPH III.

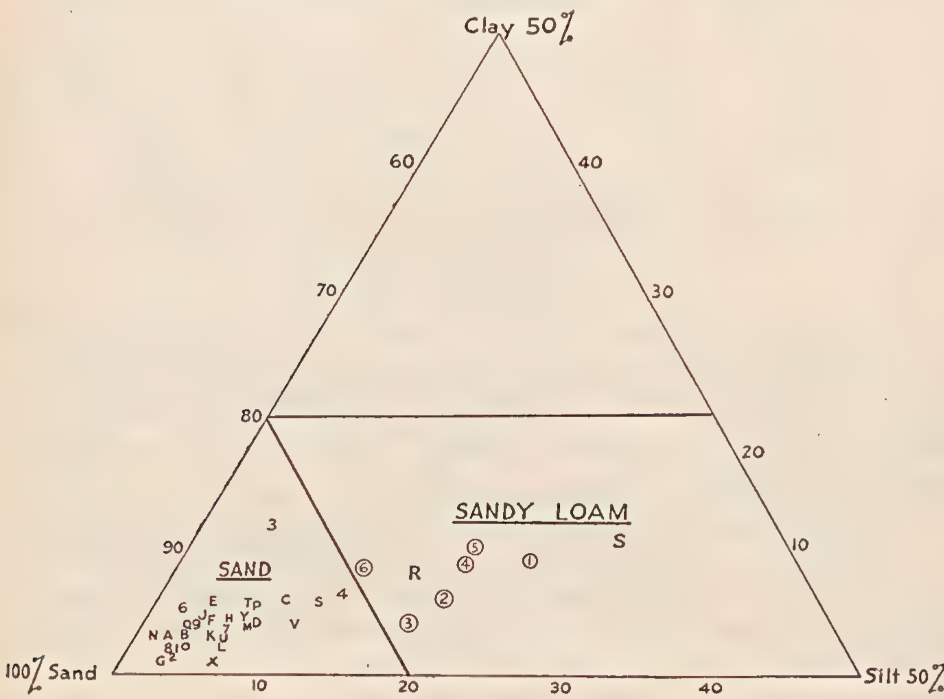


PLATE 135.

Patient co-operative effort on the part of the growers of each district in the collation of all local data, thorough and intelligent statistical analysis of such data bearing on all phases of the industry for correlation where possible with the class of leaf produced, should lead to the evolution of a quality leaf first and quantity afterwards in Queensland when the above information is combined with the knowledge of the variations in texture of the different soils.

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## THE JOURNAL IN PARLIAMENT.

*In the course of the debate on Supply in the Legislative Assembly several appreciative references were made to the "Journal" and other departmental publications, and from which the subjoined extracts are taken from "Hansard" reports:—*

*"I desire to make reference to the good work carried out by the 'Queensland Agricultural Journal.' Unfortunately, this journal does not reach as many producers' homes as it should do. I suggest that a drive be made to popularise this very efficient and valuable journal . . . If these (subscription) forms were placed in the hands of members of local producers' associations, I feel certain more subscribers would be gained, and this very valuable journal would enter many more homes."—Mr. G. F. R. Nicklin (Murrumba).*

*"I congratulate the Department upon the issue of its very fine 'Agricultural Journal' which we receive from month to month. Its useful information is of interest to quite a large number of people. The majority of the producers know nothing about the 'Agricultural Journal.' That is their own fault. Every producer . . . is entitled to it, and can obtain it at the small cost of 1s. per annum. No literature can be cheaper. I desire to thank the Department for the 'Journal.' I get it and pass it on to those interested in dairying. They find it both interesting and important in their business."—Mr. Vivian H. Tozer, M.L.A. (Gympie).*

*"I would like to take this opportunity of thanking the Secretary for Agriculture and his officers for the many kindnesses I have received during the past year in connection with matters relating to my own electorate. I would also like to say that we farmers appreciate very much the monthly journal which is issued by the Department of Agriculture. Many farmers in my district appreciate the interesting matter contained in the 'Journal,' which is very helpful to them, and encourages them in the treatment of disease and other agricultural practice."—Mr. E. H. C. Clayton, M.L.A. (Wide Bay).*

*"'The Queensland Agricultural Journal' has been kept up to a high standard of efficiency. It gives full publicity to the various experiments conducted from time to time, and items of interest in connection with research work, also the work of our technologists. This is of great help to the farmer."—Mr. Harry F. Walker, M.L.A. (Cooroora).*

# Citrus Psorosis Control.

By L. F. MANDELSON, B.Sc. Agr., Assistant Plant Pathologist.

THE citrus disease known as psorosis is believed to have originated in the Orient and been disseminated with the introduction of citrus trees from the East to other parts of the world. The disease was first described in Florida in 1897, and since then has been recorded from most citrus-growing countries.

A suspected case of psorosis was first recorded in Queensland from Bondoola in 1927 by Mr. J. H. Simmonds, Plant Pathologist. Since then it has been reported from Yeppoon, Palmwoods, Mapleton, Montville, and Grantham.

Psorosis is a disease which develops very slowly, and it may be cured if treated before it has advanced too far. The following notes describe the symptoms by which it may be recognised, and they also discuss the most suitable method of treatment.

## Symptoms.

As the outer layers of bark are first affected, the earliest symptoms of the disease are the formation of inconspicuous blisters and the scaling-off of small pieces of outer bark. The disease usually progresses very slowly, and an extension of the affected area with further loosening-off of the outer bark eventually occurs. Gum may exude from the bark of the affected tree to some extent, especially when the tree is growing actively. The exudation, however, is small, and not so conspicuous as in certain other bark diseases which are usually grouped under the name gummosis.

The trunk and main limbs, as well as small branches, may be affected, and as the disease progresses the affected area tends to girdle the limb or trunk. New bark has a thick, roughened appearance (Plate 136), is discoloured, and eventually breaks into scales or strips and sloughs off.

In time—probably after five years or more—the wood becomes seriously affected and decays. Consequently, in the final stages affected trees are stunted, the leaves produced are small and yellow, and the twigs die back. One or two limbs or the entire tree may in due course be killed.

## Varietal Susceptibility.

Sweet orange (especially the Valencia orange), mandarin, and grapefruit are susceptible, whereas the sour orange and lemon are highly resistant.

## Cause.

Owing to the very slow development of psorosis it has been found extremely difficult to demonstrate its cause. In some cases, investigators in America have produced the disease by inoculating healthy trees with pieces of diseased bark. At the present time the cause is still somewhat obscure, but it is considered that probably some very slow-growing organism is responsible.


Plate 136.—Citrus Psorosis.

### Conditions Favouring the Development of the Disease.

The scaling process appears to be most active during summer and early autumn, which is probably due to the active growth of the healthy bark enabling it to readily slough off the dry bark scales above, at that time of the year.

When the bark is damaged through being knocked by implements or in any other manner it appears to be more susceptible to infection.

The age of the bark has a considerable influence on the development of psorosis, and incidentally has an important bearing on control methods. The disease is usually not observed on trees until they are eight or ten years old, and limbs are not attacked until the bark has been formed for four to six years or more. Hence young tissue apparently has a considerable degree of resistance to the development of psorosis. This fact forms the basis of the treatment, detailed below, which encourages the production of new bark.

### Control.

The following procedure may be successfully employed for the control of psorosis, and may also be adopted for dealing with various bark diseases of citrus:—

Treatment is best carried out in the late spring or summer, and control measures must be adopted before psorosis has advanced too far, since such efforts are practically useless after the wood under the affected bark has become infected and discoloured.

Dead branches and branches which have been obviously weakened by the disease, as well as any scaling bark, should first be removed.

Treatment consists of scraping the outer bark of the affected area and beyond it, so as to eliminate the diseased tissue and to encourage the development of young, healthy tissue. A fungicidal wash is subsequently applied in order to dry out the remaining outer layers, to check the development of the disease, and also to protect the exposed tissue. It should be stressed, however, that the fungicide is merely supplementary to the scraping treatment, and that success depends upon the thoroughness with which the latter is performed.

Not only the visibly affected bark but also the apparently healthy bark for a distance of from 6 to 8 in. above and below the area and for 4 to 5 in. beyond the lateral margins of the affected area should be carefully and thoroughly scraped. The scraping should not go deeper than a third of the thickness of the bark. The outermost dark-coloured, corky tissue and most of the green layer immediately beneath it should be removed in this manner. The apparently healthy bark need not be scraped so deeply. When scraping, care should be taken to prevent the implement used jumping over gum-infiltrated areas, and cutting into the softer green bark.

Any large areas of bark which are dead to the wood should be cut out to the callus tissue which will have formed about the affected area. Smaller areas of hard bark or gum pockets need not be cut out, since they will slough off after the scraping treatment.

Various tools may be used for scraping purposes. The main essential is to have a sharp scraping edge, and to have a tool which can be used in depressions. A good, heavy knife or a box scraper is useful. The

latter consists of a reversible, triangular blade mounted in a handle. One or more of the corners of the blade may be ground off round for working in crotches and depressions. For this purpose and for light scraping, a farrier's knife with the end bent into a curve and retempered is a very useful implement.

After treatment, the scraped bark should immediately be painted with a fungicidal wash or paste. Several have been recommended for this purpose, but lime-sulphur and lime and sulphur compounds have been reported as being most effective in stimulating the bark-scaling process.

Either of the following formulæ may be used:—

1. Mix 1 gallon of concentrated lime-sulphur solution with 2 gallons of lime paste. The latter is prepared by slaking 3 lb. of quicklime in a gallon of water.
2. Slake a known weight of quicklime by adding a small quantity of water. While the lime is slaking sift slowly into it the same weight of flowers of sulphur, with constant stirring. Add only enough water to make a smooth, thin paste.

It will be found that within three to six months from the date of treatment, depending on the vigour of the tree, seasonal conditions, &c., the outer bark will crack loose and slough off. This loose bark may be rubbed off, and, if the treatment has been successful, new and healthy bark will then be exposed.

All trees which have been treated for bark diseases should be examined every few months for extensions of old diseased areas or for the development of new ones, and, if necessary, be promptly retreated. Frequently, especially with rather well advanced cases, two or three supplementary treatments may be necessary.

It must be stressed that the bark should be scraped well in advance of the obvious lesions; it should be scraped thoroughly and, finally, that subsequent treatment is frequently necessary for the successful treatment of bark diseases.

Since psorosis is comparatively new to Queensland, much of the information contained in this article has been derived from publications of the Florida Agricultural Experiment Station and from "Citrus Diseases and Their Control," by Fawcett and Lee.

AN INFORMATIVE JOURNAL.

*A Goomboorian farmer writes* (*8th November*, 1933):—"*. . . Your excellent publication, The Queensland Agricultural Journal, supplies a long felt want in giving us informative and topical articles on subjects of daily importance to the farmer.*"

# Banana Thrips and the Problem of its Control.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

THE banana thrips, *Scirtothrips signipennis* Bagnall, is no new pest in the State of Queensland. The rust with which it is associated was known in North Queensland in the early days of the industry, though the relation between the disfigurement and the pest was not established until the first decade of the present century. At that time Queensland bananas met only a limited part of the requirements of the southern States, the balance being imported from overseas. The bulk of the local industry was then in Chinese hands. On this account, together with the fact that the resources of the Department of Agriculture and Stock for research work were then slight, no intensive study was made of a problem which at the time appeared to be of mere local interest and of no great financial importance. During recent years the position has been entirely changed. Legislative and fiscal provision has been made for the industry, and under its aegis production has increased to a point at which the whole of Australian requirements, other than those of Western Australia, can be met from plantations in the two eastern States, while the cultural activities are almost entirely in Australian hands. In Queensland the greater part of the production has been centred in the southern section of the State, mainly because of the proximity to the principal markets and the consequent reduction in the freight charges incurred in the disposal of the fruit. The advance of production in the South and the marketing advantages secured by growers there caused a decline in the Northern production from even its earlier moderate dimensions until it constitutes an almost negligible proportion of the Australian crop. Hence, although the main features of the pest and disease complex in the North were more or less understood, no particular attention was paid to them until the banana thrips, previously known as an exclusively northern pest, made its appearance in epidemic proportions in the Gympie district in 1924. This was the first record of the banana thrips as a serious pest in the South, though the nature of the outbreak was sufficient to indicate that the insect must have been present for some years prior to that time. Since then consistent observations have been made on the pest and minor recurrences of the trouble noted, though until the summer of 1931 nothing comparable with the 1924 outbreak occurred. These observations indicated that the pest had spread through most of the southern districts, and it is perhaps true to say that it exists in all productive areas, though in some instances the losses are negligible or non-existent.

The first Gympie outbreak proved so serious that steps were taken immediately to procure information on the life history of the pest with the ultimate object of formulating control measures. A. A. Girault took charge of the investigation, and his conclusions were published in 1925 as Bulletin No. 1 of the Division of Entomology and Plant Pathology. This work contains a very comprehensive statement of the bionomics of the pest. Preliminary experiments on the control of the banana thrips were recorded, but for some years suitable field material for the elaboration of the inquiry was not available in the southern part of the State.

In 1926 some development took place in the north, and a considerable number of growers planted commercial areas in various localities. During the first cropping year, the banana thrips caused heavy losses, and the study of control measures became a matter of some urgency. Froggatt initiated control experiments in 1927, and explained the possibilities of calcium cyanide dust. Since that time northern plantations have suffered to some extent each year, while the encroachment of the pest on previously clean areas in the south culminated in heavy losses during the summer of 1931-32.

With the establishment of an entomological field station at Cairns in 1928, it seemed desirable to study the control phase of the problem for two reasons. The first derived its emphasis from a probable development of the industry in the north—a development which for various reasons has not materialised. The second depended on the availability of experimental material in plantations near Cairns. This bulletin summarises the data to the present time, and discusses the problem from a number of different angles.

### Thrips in Relation to Rust on Bananas.

The banana thrips belongs to a group of insects, the *Thysanoptera*, representative species of which are known to attack many cultivated crops, epidemics in some instances being quite common. It is natural, therefore, that the group should have been studied in some detail in most countries where agriculture is a permanent activity. The whole range of insecticides has consequently been exploited, and some conclusions were drawn which served as a basis for this work. Briefly, these indicated that only insecticides such as nicotine which kill by contact or others dependent on direct fumigation are of any material utility. Though insecticides were originally applied in spray form, there has during recent years been considerable development in the manufacture of dusts for the purpose, but in almost all cases the degree of control secured has been determined by the accessibility of the insects at the time of treatment. In the case of the banana thrips the problem is somewhat complicated by the conditions under which the host crop is grown. For the most part plantations are situated on steep slopes more or less removed from the adequate water supplies necessary for the convenient preparation and use of sprays. Hence, apart from a limited acreage grown on creek flats, sprays may be omitted from the available means of control and attention concentrated on dusts of some kind or other. In his preliminary work, Girault indicated that pyrethrum might be useful when used as a dust applied directly to the bunch. Froggatt later reported satisfactory results with calcium cyanide, a dust which liberates prussic acid when exposed to the air, but the possibility of injury to the fruit demonstrated in subsequent plantation practice led to its ultimate abandonment. Hence the present work touches other phases of the subject which have not so far been explored, while an attempt is made to bring the whole question into its proper setting as an integral part of the pest and disease problem in the banana plant.

### The Nature of Banana Thrips Rust.

The essential nature of the rust phenomenon has been outlined by Girault and merely needs recapitulation here. The injury is caused by the superficial feeding of the insects on the surface of the fruit. In its early stages, this consists of mere surface erosion, but as the attack

may take place when the fruit is very young the injury may be out of all proportion to the numerical population on the bunch. At first there is a slight discolouration, which may or may not develop into rust—that particular type of discolouration from which the trouble derives its name. But the nature of the rust varies, being sometimes glossy red over the surface and sometimes ochraceous. In mild cases the injury is restricted to the contact surfaces* of the fingers and may be of no great consequence. It may, however, extend over the whole surface of the fruit without associated splitting of the rind. Sometimes the injured rind is incapable of adjusting itself to the physical demands made upon it during subsequent growth, and cracks, the depth of which vary with the severity of the injury, appear on the surface. Thus the damage associated with thrips shows all gradations from simple discolouration of the fingers at the contact surfaces, to discolouration over the whole surface plus more or less severe disruption of the rind. In North Queensland, fruits of the latter type are usually of a reddish colour, but this may not be general. It would appear that if for any reason bunches remain attached to the parent plant for any considerable length of time, an ochraceous colour is more usual. This is typical of those bunches, which, thrown in late summer, remain attached to the plant for some four or five months before being ready for cutting. Such bunches are common in the south of the State, where growth conditions are less favourable than in the north at any given period of the year. No matter what the colour, the appearance of the fruit is so affected that, even if marketable, its value is seriously depreciated.

When colour or rust first attracted attention in the southern markets, the cause of the blemish was quite unknown. The first suggested explanation came from New South Wales in 1903 when Cobb, handling marketed fruit showing the typical symptoms, claimed to have isolated a causal organism, but Tryon after familiarising himself with the field aspect of the trouble, concluded that the banana thrips was the primary cause. Later workers have all confirmed his observations. Cobb's earlier thesis is perhaps explicable when it is remembered that though thrips attack a number of cultivated plants, none show symptoms analogous to those associated with the banana. The uniqueness of these prompts a discussion of the phenomenon.

The anatomy of thrips mouthparts has been described by Peterson and others in an attempt to explain the mechanism of feeding within the group. Of the several species studied, no significant differences from the type form have been noted in the Terebrantian thrips, the distinctive point being the general absence of the bilateral symmetry which is usual in the oral appendages of the Insecta. Instead, one of the mandibles is almost vestigial while the other is modified to serve as a stylet moving within the cover of a cone formed by the upper and lower lips. These modifications have become associated with a type of feeding which combines a scraping with a sucking action, the fluid contents of the injured tissues being thus imbibed by the insect. With an injury of this type to the rind, it has been assumed that the phenomenon of rust in its several phases is the consequence of a natural callus over the wounded surface, the colour of which is modified by the peculiar properties of the exuding sap.

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* "Contact surface" is a term frequently used in this paper to designate the apposed surfaces of adjacent fruits where the banana thrips tend to congregate. In current parlance the term implies poximity, but not necessarily actual contact.

The sap in some Musaceæ may at times possess a high tannin content. In the banana plant the concentration of tannin reaches its maximum in the bunch, being at its greatest intensity when the fruit is young and disappearing slowly as ripening takes place with the accompanying aggregation of sugars. Should the sap be removed from the bunch, discolouration takes place on exposure, and it is presumed that this discolouration of the extract is due to some derivative product from the original tannin content. One of the commonest tannin derivatives is phlobaphene, and its colour characters correspond to some extent with those of the exposed and congealed sap from the banana plant. If the rust characters are correctly attributable to phlobaphene, it ought to be practicable to induce at least something like rust by artificial means, and a series of trials were commenced with this end in view.

When sap is first liberated from cut tissues or injured surfaces, it flows as a translucent whitish fluid with a syrupy consistency which varies according to the part of the plant from which it is extracted, being most viscous in the region of the bunch stalk. This translucent appearance is quite transient, for the solution gradually congeals or drys out into a gel-like product, assuming a brownish colour which may not necessarily be evenly distributed through the matrix. Drops of such fluid may often be found on the fruit, either in the immediate vicinity of fruit fly punctures or on the uninjured surface contaminated by drippings when the fruit is being cut and packed for the market. Presumably these, as examples of sap exposed to the air, share some of its tannin content and the colour would then be due to derivative products resulting from exposure—phlobaphene in particular. The brownish colour which everywhere occurs in free sap is, however, distinct from the glossy red typical of rust. The thickness of the sap deposit makes no difference to the essential colour, for a reduction in the thickness of the fluid merely reduces the intensity of the colour, until it ceases to be evident. Hence it follows that sap exudation by itself is not sufficient to induce rust—at least on a smooth surface such as that offered by the rind of the fruit.

The methods adopted in the experimental attempt to produce the phenomenon of rust artificially were quite straightforward. Sample fruits were treated according to a given plan, the reaction within the next few hours being noted and the appearance a fortnight or three weeks later recorded. The essential data is detailed in Appendix I., and only a summary statement given here in the main text. In some instances the rind was merely pricked with a sharp pointed needle over a given area, the depth being adjusted from superficial pricking to fairly deep insertion. Linear scratchings were also used, again with the same variations. In a third series, the instrument used was an eye scalpel, which induces a different type of injury with a broad V groove. In all these three types of surface injury the rind was destroyed to a depth varying from superficial injury with the minimum sap exudation, to violent injury in which the rind was destroyed to a depth of one-sixteenth inch. A fourth series allowed for the treatment of the surface of the fruit with a rasp or sandpaper of varying degrees of coarseness. Fresh sap was applied to the injured surfaces of some fruits in each series either with or without the crushed body contents of a number of thrips. The experimental material in each individual treatment included fruits from bunches of different ages. In this miscellany, it was practicable to assess the reaction of the fruit to injuries of various types, some of which

should approximate to that actually caused by the insects themselves when living on the fruits. After pricking, the sap accumulated in globular masses at the point of injury, but with general surface destruction there was a greater tendency to run. The sap, congealed on a sandpapered surface, showed the same essential features as have been cited in connection with other types of injury, except that when present in globules it was less easily removed.

The colour appearances of the several calluses were by no means consistent. When the surface of the fruit was completely injured, an initial dark discolouration subsequently yielded an ochraceous callus with a uniform colour over the whole surface. In the case of linear lesions, however, the colour of the callus varied from an ochraceous shade on the inner edge to a reddish brown at the outside. Within this range of colour some phases were comparable to rust proper, and this might be taken to indicate that the phenomenon of rust depends on a precision of injury depth which can only be reproduced with the greatest difficulty by experimental means. This explanation may be correct, but further contingencies may be noted. These include the cumulative effects of slight injury on any given fruit surface over a long period of time, the possible subsidiary consequences of colony movement through exuding sap, and finally, the probable incorporation of fœcal products in the drying medium. The possibilities latent in the second and third contingencies are beyond the resources of the laboratory, and could only be partially studied by treating wounded surfaces with sap exudate to which the crushed bodies of thrips had been added. No signs of any influence from this treatment could be obtained.

From the data so far outlined, it has to be concluded that the phenomenon of rust so far eludes reproduction by artificial means. The various phases of the work do, however, indicate the probable nature and mode of development of rust. The colour is almost certainly due to a tannin derivative, phlobaphene, its intensity being the cumulative effect of the constant deposition and redeposition of sap on one area as injury from the pest becomes more severe. The ordinary exudation would be so slight as to be negligible, but even a slight exudation continued over a considerable part of the life of the fruit would give colour without a depth to a once fluid medium, and thus rust in one of its many forms. Prolonged erosion of the fruit surface by the thrips together with their continual movements over the injured tissues may induce the marked adhesion which is characteristic of rust, in contrast with simple sap deposition in the experimental material.

The banana thrips has very definite phototropic reactions which tend to keep the insect well within the cover of shade. Normally in a well developed banana bunch, such shade is provided over the whole surface of the fruit prior to the shedding of the bracts, but once these are cast off the insects are restricted to a pasturage at the contact surfaces of the fruits, the shelter of the vestigial flower at the tips, or the sheath covers of the pseudostem. In a perfectly thrown bunch it is possible to have the bulk of the fruit discoloured if the thrips infestation is sufficiently heavy during the three weeks after eversion. Normally, however, the rusting would be confined to the contact surfaces of the fruits where, of course, it may be quite severe, but in any plantation the perfectly thrown bunch is the exception rather than the rule, and all

kinds of variations from the ideal type may be found. This is in no way surprising, for bunch throwing and fruit development place a tremendous strain on the resources of the plant.

There may thus be bunches whose size has been determined in a period of more than ordinary vigour, but which are thrown when the vitality of the plant is at a low ebb through climatic and subsidiary pest causes. There may be others in which eversion has been normal, yet the subsequent development of the bunch slow. In any plantation in its second cut, all the permutations and combinations possible in a habitat where pests, climate, and plant vigour vary may be found registered in the quality of the fruit and the conformation of both fingers and hands. In an area free from the banana thrips these may be of little moment, for adjustments over the bunching period compensate for aberrations in any one stage. In Queensland, where the pest is generally distributed, these aberrations are of some importance, for they influence the activity of the pest, and irreparable damage may be effected in a very short time. Some of these abnormalities require special notice:—

(*a*) *Non-inversion of the Bunch.*—In some classes of soil frequently and in others occasionally, stools may be observed in which the bunch appears erect in the throat of the plant, the bracts having rotted *in situ* while the visible fruit possesses the dull green colour normal to the sub-mature or mature fruit. The bunch when cut out may contain sufficient hands to permit its classification as a potential first class bunch, or it may be a mere pigmy specimen of only freakish interest. Though the original quality of the two bunches is so entirely different, the same causes have been operating in each case to produce the choking in the throat of the plant. The essential point is that at a critical stage in the development of the bunch, growth has been almost completely arrested. Later on growth may be resumed, but in the meantime the structure of the various parts of the plant associated with the bunch have become much less plastic, and instead of a simple resumption of growth a type of plant cretinism is observed in which the bunch stalk is twisted within the pseudostem in such a way that to even support a pendant bunch would be quite impossible. Hence efforts to induce pendancy by cutting open the throat of the plant invariably fail, the stalk breaking before the bunch achieves maturity.

(*b*) *Delayed Inversion.*—The aberrations included in this category are essentially of the same nature as the former, but less severe in their effects. Commercial fruit may be obtained from affected bunches, though some hands present abnormalities in the shape and contour of the fruit. In the case of non-inversion, doubling back of the bunch stalk within the main stem is the rule; in delayed inversion it is the exception. The phenomenon appears when the growth rate slows down considerably, and the interim between the appearance of the bud in the throat and the shedding of the bracts is proportionately lengthened. It may also be evident should growth cease for any reason during the pre-bract-shedding stage. The symptoms are distinct. Instead of hanging vertically, the bunch has more the appearance of being thrust from the stem in a downward direction at an angle to the parent plant. In all cases the fruit has an aged appearance even before the bracts covering the hands are shed. Compaction of the basal hands is usual, for, though growth has apparently been normal at the inception of inversion, the change has taken place before the basal hands have been properly extruded. A

certain amount of food material is then passing through to the bunch, and individual hands have to expand within the very definite limitations imposed by the boundary of the throat. All types of fruit then appear in conformity with these limitations—the natural line of the adjacent fingers may be disturbed and neighbours overlap, the contours of individual fruits may be altered, and bizarre forms induced at this stage may persist to some extent even when growth again becomes normal. One of the most important features is the slow separation of the fingers in bunches subjected to delayed inversion. Fruits naturally rectilinear in cross section when first exposed fill slowly with a consequent delay in the appearance of the rounded contour, which initiates the separation of the individual fingers, and consequently adjacent fruit surfaces are apposed for a much longer period than would otherwise be the case.

The causes of variability in growth vigour are much the same as those which have often been noted in other crops. Bananas are grown on several types of soil of variable fertility in regions of widely different rainfall, and with all degrees of plantation management or lack of management. Over most of Queensland, however, it may be assumed that during the winter and spring months, the perversions of type habits described above are accentuated, and bear an extraordinarily close relation to two factors in the environment—viz., precipitation and the capacity of the soil to retain moisture. Should the main summer rains fail in any part of the State, almost all plantations, unless very favourably situated, bunch abnormally, while it is doubtful if ever a year goes by in any plantation without some bunches showing these or fundamentally similar abnormalities. The dual factors, rainfall plus the moisture retaining capacity of the soil, explain the major part of the trouble when the phenomenon is widespread. Others, however, such as pathogen activity or physical inadequacy of the soil, may also play a part by reducing the efficiency of the available root system. The rapidity with which plants show signs of impoverishment when subjected to slight deviations from the bioclimatic norm may be due to a multiplicity of causes. Ordinarily, plants reaching the bunching stage or carrying a young bunch should yield on examination a host of white turgid roots penetrating the soil both laterally and vertically. Very few plantations possess such a perfect root system, and in its place the only surviving roots are found to radiate from the corm in close proximity to the surface of the soil. Under such conditions it is scarcely remarkable that even a passing dry spell of but short duration may produce striking and even disastrous effects out of all proportion to the apparent cause.

In thrips infested areas, the physical malformations due to variations in the growth vigour of the plant are not in themselves of major interest. It is the influence of such abnormalities on thrips habits and activity which merit special attention, and the chief of these concerns the provision of shade conditions within the bunch for a longer time than is usual or desirable. Before elaborating these implications, it may be as well to summarise the method of bunch infestation and the relation which it bears to rust.

In the plant prior to bunching, colonies may be located under the membranous sheaths which border the decaying bases of leaves now past their period of usefulness to the plant. Passing nearer to the throat of the plant, the numerical incidence of the colonies diminishes, and when they do occur the age of the associated larvæ and the numbers per colony indicate, as would be expected, later establishment. In the

upper reaches of the plant, however, colonies are non-existant and adults alone are found secluded in any cover which may be available in the throat, sometimes at the base of the last leaf to be unfurled, their exact position being determined by the state of unfurling at the time of examination. Even the furled leaves are infested, for a membranous fringe to the leaf margin is so apposed to the adjacent leaf surface that adult thrips can penetrate to the tip of the leaf just about to unfold without being exposed to the open for a moment. This is of some importance to the bunch about to be thrown, for just as the bud appears adults are already in the vicinity to initiate infestation when conditions are favourable. In the basal hand, there is a space at the side into which the adults at once make their way and then pass from hand to hand until the whole bunch is infested—before bract loosening has begun. Egg laying takes place in the fruit and development quickly follows. Thus, in the thrips-active months of the year, even a normally thrown bunch may be infested with colonies of young before the protecting bracts have been shed. The actual injury caused by the adults themselves is slight, and their main importance depends on the colonies, or rather aggregates of immature forms for which they are responsible. Until the bracts are shed, no artificial control is possible, and with normally thrown bunches the injury has not, as yet, reached serious dimensions by the time control measures can be applied.

With abnormally thrown bunches on the contrary, the crucial factor is the extended duration of the throwing period in which two phases of thrips activity require notice. The first of these concerns the numbers of adults actually penetrating the bunch prior to its complete extrusion from the throat of the plant. The tendency of the adults to pioneer the pest exploration of the upper parts of the plants has already been stressed, and the obvious corollary of this habit is that the longer the bud is intimately associated with the throat of the parent plant, the greater the initial adult population of the bunch. Field observations indicate that neither adults nor larvæ migrate along the stalk to the bunch unless compelled to do so by special conditions such as overcrowding. Thus under ordinary conditions, stalk protection of the most complete type makes no difference to the losses through rust on the fruit. It follows then that the increased incidence of rust associated with delayed inversion is due to the increased adult infestation of the bunch. An increase in the total initial adult population implies a greater capacity to reproduce and found new colonies in the several hands. There is inevitably an interval between the first penetration of the bunch, and complete infestation. At this time eggs are being laid—by the females aggregated in the basal hands, to which they have ready access and the greatest freedom of movement. The earliest hatched larvæ thus occur in the basal hands, and this is one, though by no means the only, reason for the observed phenomenon that rust on any bunch is always most acute there.

The second consequence of abnormalities of this type depends on the extension of the period in which the thrips have abundant shelter, shade being essential to colony stability. In all bunches there is a stage in which individual fingers are closely fitted together under conditions of complete shade. At this time there is nothing to restrain the movements of the insects, and they wander at will over the whole surface of the fruit, though most of the eggs are laid on, and most of the young restrict themselves to, the interfruit surfaces. Delayed inversion prolongs the period in which the insects are feeding on the whole fruit

surface at a time when the surface is particularly vulnerable to injury of any kind. The twofold consequences of delayed inversion are, therefore, an increased thrips population on the bunch and an extension of their available pasturage for a prolonged period, in which no control measures are practicable.

From this elaboration of the details of thrips activity in the early life of the bunch, the discussion of discrepancies between thrips infestation and the incidence of rust may be resumed. It is quite conceivable that two stools may be standing near one another in the plantation, carrying equivalent thrips populations, and yet showing a marked disparity in the loss due to rust. Almost any plantation will furnish examples. In some instances the conformation of the fruits in the mature bunch will indicate the explanation, while doubtful cases may be checked by tracing the development of the bunch from eversion to cutting. Even after the bracts are shed, the pasturage of the insects may remain extensive if the growth vigour of the plant is low, with consequent delay in the spacing of the fruits and change in their contour from the rectilinear to the rounded form.

## EXPERIMENTAL WORK ON CONTROL.

Though the life history data on the banana thrips was fairly complete at the commencement of the experiments now under discussion, the control data was in a much less satisfactory position. Widely different opinions concerning the value of insecticides has been expressed by growers. Hence prior to initiating any further work, the affected areas in the north were visited with a view to sifting the available field information. Unfortunately, the opinions of interested growers yielded nothing but a chaotic mass of material which rarely agreed with the theoretical attributes of the insecticides concerned. Earlier official recommendations having proved somewhat disappointing in handling this extremely difficult problem, growers had for some years been using a variety of insecticides, claiming success for some of them. Most seemed to have no sound basis, but in view of the decided lack of authentic information the early phases of the work were restricted to field trials with a limited number of possibly useful insecticides, including some sprays. It was thus hoped that systematic observations during a northern summer would indicate the precise nature of the problem, and the fields worth special study.

### Preliminary Experiment.

The plantation used was situated near Cairns at Edgehill on soil which, though perhaps not ideal from the cultural point of view, permitted the use of implements, thus offsetting to some extent certain natural disadvantages. The vigour of the plants was more or less the same over the whole area. The crop was approaching its second main cut, hence the bunches lacked any uniformity of development. Ideal material for experimental purposes is procurable only on a crop coming into its first cut, when the bulk of the bunches should be thrown during a six-week period. Difficulties inevitable when such a uniform series of bunches is not available are minimised to some extent by applying any individual treatment to bunches of different ages. Areas treated with any one insecticide contained both young and old bunches, and in none was either class unrepresented. Within any such group, the accumulated observations allow deductions as to the value of the spray or dust being investigated.

Some index of the vigour of the plants bearing the fruit to be treated is a necessary preliminary to assessing results. One may note the number of fruits per bunch, the size of the plant and so on, but in practice it is found that none of these individually or collectively give the information required. Better results have been secured by keeping a record of bunch development from the time of inversion to the time of cutting. The duration of this period varies throughout the year, but given two bunches thrown at the same time and requiring markedly different intervals for their development, the disparity will indicate the degree of difference in the experimental material, for idiosyncrasies in plant vigour from whatever cause are invariably reflected in idiosyncrasies in bunch development—differences of some moment so far as dusts and sprays are concerned. These variations from plant to plant may be due to a number of causes, root failure, nematodes, &c. Hence it is more than usually necessary to apply each individual treatment to a considerable range of plants.

The experimental scheme may be shortly summarised here. Three insecticides were introduced, lead arsenate, Black leaf 40, and Cloudform tobacco dust. Black leaf 40 and Cloudform tobacco dust possess, of course, the same toxic ingredient, nicotine, which in one form or other takes precedence in the control of allied pests in cultivated crops; hence no explanation of its introduction here is necessary. Lead arsenate, however, comes into a different category. The feeding habits of the banana thrips are such that toxic affects from a particulate poison which must be ingested by the insect would not be anticipated, yet claims have been made for the spray which at least warrant some inquiry. The treatments given were five in number, viz.:—

(*a*) Lead arsenate.—Rate, 3 lb. to 50 gallons water.

(*b*) Lead arsenate and casein spreader.—Rate as in (*a*), plus 1 lb. spreader.

(*c*) Lead arsenate and Black leaf 40.—Rate as in (*a*), plus 1 pint Black leaf 40.

(*d*) Black leaf 40 and soft soap.—Rate, 1 pint to 50 gallons water, plus soft soap.

(*e*) Cloudform tobacco dust.—2½ per cent. nicotine.

The area under experiment included 250 plants, 50 being assigned to each treatment. The thrips fauna at the inception of the work in March, 1929, was moderately heavy, though the amount of waste attributable to rust would not be considerable. The treatments were given at three-weekly intervals and repeated observations made before, between, and after each. Bunches in various stages of development occurred in each plot, and those just inverted were marked at the time of the initial treatment. The simplest method of marking consists in merely engraving the date on the bunch stalk—the subsequent callusing of the injury brings the date into sharp relief with the general green background of the stalk. There is no need to discuss the incidental problems raised by the mixing of the ingredients in the sprays. All the methods used are incorporated in general entomological practice and no new features were recorded.

The estimation of the value of individual sprays turns on the comparative amounts of rust observed on the fruit when the bunch is cut. With this criterion, it is possible to assert that none of the sprays

or dusts completely eliminated the rust phenomenon. A diminution of the amount of rust could, however, be detected in the bunches subjected to the lead arsenate-nicotine combination, the lead arsenate-spreader mixture and the tobacco dust. The improvement in the appearance and the value of the fruit was most marked on those bunches which received the initial spray or dust application immediately after the shedding of the bracts. Fruit treated with the tobacco dust was rust blemished only at the bases of the fingers, an improvement which would be anticipated were the thrips population materially reduced. In contrast with this, the two sprays of value containing lead arsenate restricted the rust to those parts of the fruit not carrying a spray deposit, the boundary of the deposit being also the boundary of rust incidence and presumably thrips activity. It is curious that lead arsenate used alone and Black leaf 40 used alone gave no apparent protection to the fruit.

In the several bunches from each plot, a considerable variation in rust incidence was obvious. Bunches semi-mature or further advanced at the time of the initial treatment showed no improvement, but others treated at an earlier stage in their development were cleaner than corresponding check bunches in the remainder of the plantation. Even in bunches of the same age, subjected to similar treatments, the rust incidence varied considerably, though such differences could usually be explained by reference to such disturbing factors as the conformation of the bunch and the relative efficacy of spraying as estimated by the particulate deposit left on the fruit surfaces.

From the results so far enumerated, some conclusions can be drawn. In the first place, none of the insecticides provide a complete solution of the problem; the data merely sheds light on the reaction of thrips to a number of insecticides applied periodically to the banana fruit. These contain either one or both of two toxic ingredients, lead arenate and nicotine, each of which may be discussed separately.

Lead arsenate alone gave no tangible control. In conjunction with either a casein spreader or nicotine sulphate, a limitation of the rust incidence was effected, particularly if the spray reached the fruit when the hands were first exposed. Such a result seems to clash with the usual conception of lead arsenate as an insecticide which must be ingested by the pest if any control is to be exercised by it. The determination of its real action in these trials thus seemed worthy of further investigation, and preliminary laboratory studies were therefore initiated.

Colonies of thrips were established on banana fruits, parts of which were treated with lead arsenate in both dust and spray forms. A series was arranged in which the appearance of the dust or spray deposits varied from visibility to below visibility, and colonies of thrips were established on the clean areas of the fruits.

The colonies included both adults and larvæ. No difficulty was found in establishing the insects on the fruits, and reproduction proceeded unabated for larvæ hatched from the fruits after a fortnight's enclosure. Rust appeared in the regions of colony formation. When the dust or spray cover was both visible and complete, the insects made no attempt to leave the clean parts of the fruit, and on these alone was rust ultimately found. The mortality rate was comparable in both treated and untreated fruits; hence it must be presumed that the toxic properties of lead arsenate have no influence on thrips habits, though

the insecticide does limit the range of their feeding sites. That the deposits showed some insecticidal value in these experiments cannot be gainsaid, but such a value must be inherent in the dust cover. It would thus appear that lead arsenate is insecticidal but non-toxic so far as the banana thrips is concerned.

This conclusion is confirmed by the distinct difference in the results with lead arsenate with and without spreader. In the latter the spray aggregates in globules of various dimensions over the surface of the fruit; in the former the globules are the exception, and in their place is an even deposit. It is the limits of this deposit which act as a barrier to the spread of the pest, and limit the rust affected surface of the fruit.

The influence of the nicotine on the lead arsenate is more difficult to assess, especially as the nicotine sulphate did not appreciably alter the rust position when applied alone. The worth of this insecticide depends very largely on the weather conditions at the time of its application. High temperatures prove most suitable, and it is just possible that the negligible results from the use of nicotine sulphate alone are attributable to unfavourable temperatures during spraying. The only other apparent cause would be a hypothetical influence of the nicotine sulphate on the surface tension of the lead arsenate—Black leaf 40 spray, whereby the deposit would be more evenly distributed than if the latter were omitted. Little is known about this phase of the subject, but there is some evidence to indicate that nicotine sulphate has some such property.

In the case of the spray and dust containing nicotine there is again a discrepancy in their respective efficacies which seems to suggest an influence from some factor other than the toxic constituent of the insecticide. The discrepancy may depend on differences in the accessibility of the fruit to dusts and sprays. Dusts would penetrate into crevices between the individual fruits from which fluids of any kind would be excluded and be less effective on that account. The balance of evidence in favour of the dust may again be attributable to its physical properties in much the same way as has been described in connection with lead arsenate. Hence a nicotine dust may thus be an insecticide which is both toxic to the insects and a hindrance to their free movement on the plant. Confirmation was sought by laboratory studies with a number of the dusts available. Experiments were commenced in which colonies of insects were subjected to several treatments, some of which had been previously used in the field. By this means, data was collected on colony behaviour over a period of some weeks. The essential procedure was as follows:—

The apparatus consisted of glass cylinders sufficiently large to hold a rust-free, submature fruit, but small enough to permit the examination of the thrips without the removal of the banana. Linen covers closed the ends of the tubes, the series being supported at an angle of 15 degrees by a wooden frame constructed for the purpose. At the lower end of each tube, damp but not wet soil served to increase the humidity and incidentally to accommodate pupating forms. By the artificial control of shade, each cylinder offered a range of light conditions varying from almost complete darkness at the base to complete exposure at the upper end. Hence as each fruit filled about three-quarters of the length of each tube, part lay in one environment and part in the other. When colonies were established on fruits not treated in any way, individuals introduced

at the upper lighted end of the container scattered immediately to the shaded parts of the fruit. Here the gradual aggregation of thrips led to the re-establishment of the loose colonies typical of the species. Supplies of thrips were procured from submature bunches of no commercial value, and the material included both adults and larvæ. The adults proved more suitable for experimental work than the larvæ, but the limited numbers of the former compelled the use of both forms. From the available range, some information on the reaction of specific stages to the various dusts was procured. Colonies contained from 50 to 100 individuals transferred from fruit to fruit by means of a camelhair brush, while the dusts were in all cases applied to a concentration of mass visibility.

The data from each case may be summarised as follows:—

I. Lead arsenate used without dilution.

(*a*) Area dusted.—Intermediate third of the fruit.

No insects crossed the barrier to the part of the fruit with the most favourable shade conditions.

(*b*) Area dusted.—The half of the fruit towards the base of the tube.

Barrier effective except where the dust had been removed from the angles of the fruit by contact with the glass.

II. A.P. No. 4.—Lead arsenate 10 per cent.; kaolin as carrier.

(*a*) Area dusted.—One half of the fruit towards the base of the tube.

Barrier effective where the cover was intact.

(*b*) Area dusted.—The whole fruit prior to the insertion of the colony.

Most thrips left the fruit shortly after arrangement, odd individuals persisting on parts cleaned by rubbing against the glass.

(*c*) Area dusted.—The whole fruit after establishment of the thrips colony.

Movements sluggish immediately, most insects leaving the fruit, but remaining active on the glass.

III. Cloudform tobacco dust.—Nicotine 2½ per cent.; hydrated lime as the carrier.

(*a*) Area dusted.—One-half of the fruit; this towards the base of the tube.

Most of the insects died within a short time of the arrangement, odd individuals persisting.

(*b*) Area dusted.—The whole fruit prior to the insertion of the colony.

Effect fatal.

(*c*) Area dusted.—The whole fruit after the establishment of the colony.

Effect fatal, presumably through fumigation.

IV. Kaolin.—The commonly used carrier in insecticidal dusts.

(*a*) Area dusted.—One-half of the fruit, this towards the base of the tube.

Barrier effective.

(*b*) Area dusted.—The whole fruit prior to the establishment of the colony.

Most adults and larvæ leave the fruit immediately; odd individuals persist on parts cleaned by rubbing against the glass.

(*c*) Area dusted.—The whole fruit after the establishment of the colony.

Movements sluggish, the insects leaving the fruit and wandering round on the glass.

## Discussion.

In estimating the worth of any insecticide it is customary to ascribe the whole of its value to any toxic ingredient which it may possess. The above work indicates that this conception of things is not altogether correct. Three of the dusts used, lead arsenate, lead arsenate diluted to a concentration of 10 per cent. with kaolin, and kaolin alone yielded results with the banana thrips which are comparable in every way. With these three dusts, two are toxic, while the other is non-toxic in the sense that it does not possess any ingredient which is directly fatal to the insect. The only property which they all share is their particulate nature, and the behaviour of the insects on surfaces treated with the dusts suggests that any value which either or all may possess in the control of thrips depends essentially on this common property. Precisely what the effect of a dust cover on the fruit may be is difficult to estimate —it may be the obstacle it offers to free locomotion, or it may be the complications which it introduces into the feeding process. Whatever it may be, it has to be concluded that certain residues on the surface of the fruit hamper feeding and make colony establishment a difficult matter for the insect, and in the laboratory the range of feeding sites can be controlled at will by adjustments of a dust cover.

It would thus appear that inert dusts free from toxic ingredients may be of value in the control of the banana thrips while at least a knowledge of their real action must have a considerable bearing on the problem.

## Inert Dusts in the Control of the Banana Thrips.

A number of entomologists have during recent years brought forward evidence to show that some inert dusts have decided insecticidal properties when used against certain pests. It would appear from their work that the value of these dusts is related to their physical properties, which restrict or prohibit the free movement of the pest. Thus the codling moth larva is said to be unable to effect an entry into the fruit if an inert dust cover is applied. A number of such dusts are already familiar in insecticidal work, not on account of their own specific worth, but as diluents for the toxic dusts in common use.

Only two dusts were available for the work, kaolin and talc, and a series of experiments similar in all essentials to those already outlined was initiated. Instead, however, of being content with such a term as

mass visibility, to indicate the concentration of the dust on the fruit surface, an attempt was made to determine the concentration which acts as an effective barrier to thrips movement, above which it is completely inhibited and below which colony establishment is possible. The counting of dust particles within a circumscribed area representative of the dusted fruit surface proved somewhat too difficult for ordinary convenience, and was therefore replaced by a series of microscopic colour contrasts. Limited areas on Bristol board coloured black with Indian ink were flecked with the point of a needle at even spacings to give a laboratory series of square centimetres containing from 50 to 400 white points, the series increasing by 25 points per square centimetre. Using constant optical outfit on the binocular microscope, an estimate of the dust concentration on the surface of the fruits could be secured by colour contrasts, in one case white granules of dust on a green background, in the other white intrusions of exposed Bristol board on a black background. Thus in any particular set of readings the magnified dusted surface of the fruit was compared with the unmagnified Bristol board series. The magnification being known, the particle numbers per given area of the fruit surface could be calculated, and thus the concentration estimated with some degree of accuracy. In determining the dust concentration of any fruit a number of readings were taken, the arithmetic mean being accepted as the desired statistic, at best a convenient approximation.

The essential data is set out in Appendix II., and only a brief summary of the results need be given here. Kaolin would appear to require a lower effective concentration of the dust to inhibit colony formation than does talc. The relative concentrations in terms of particles per square centimetre are 8,000 to 10,000 or in terms of mass cover 4 : 5. This simply means that heavier applications of talc would be necessary to procure the same results as those given by kaolin. Even when the concentration of the dust falls below the critical point—i.e., the concentration at which colony formation is inhibited—the movement of the insect over the surface of the fruit is hampered and there is some limitation in the amount of rust induced by the colony. On the other hand the conception of a term like "critical point" conveys little if the dimensions of the colony are not known, for the effective minimum concentration varies with the colony size and colony constitution. If the colonies are large and the available pasturage limited, the insects tend to encroach on the border line between the dusted and undusted parts of the fruit.

The nature of the grinding used in the preparation of these two dusts may also influence their measurable insecticidal properties. The talc used differed from the kaolin in two respects, for the particles of the former tend to be angular and lack the tendency to aggregate characteristic of kaolin. When insects wander over dusted surfaces they pick up fragments of the dust on their appendages, and the particle accumulation hampers their movements a great deal. This hampering is more pronounced in the case of kaolin than in that of talc.

In both dusts, the behaviour of thrips faced with dust concentrations just below the critical points was similar. The adults rapidly survey the surface in search of an area offering the optimum conditions for temporary establishment, but in the final equilibrium, both adults and larvæ occur together on dusted and clean areas of the fruit. Larvæ pick up dust particles much more readily than the adults, and are less

able to rid themselves of such impedimenta; hence it would appear that the adults would be the first to break across a diminishing dust barrier. Laboratory conditions suggest that if the dust cover does not altogether prevent larval movement, the immature forms ultimately locate the more sparsely covered areas on dusted surfaces and associate together in colony form. This is probably due to the fact that colony habits are essentially a larval trait.

An hour or so after the insects are introduced into the cylinder, reorganisation leads to colony formation. If the dust concentration is sufficiently high, the colony is finally located at the under surface of the fruit immediately adjacent to the margin of the dust. Numerous variations all explicable on the nature of the individual fruits distinguish the colony types. Thus some were scattered along the dust margins tapering away towards the apex of the fruit, while others congregated together in a dense mass. A third type occurred in which a subsidiary colony took up a position at the tip of the fruit in the shelter of the floral appendages, or in the corrugations common to these tips even when the appendages are removed.

In this series of experiments, a colony comprised some fifty insects, sufficient to cause rusting within a few days. At the higher concentration the dust barrier was effective, no insects crossing the line separating the dusted and undusted parts of the fruits. As the dust cover approached the critical point—i.e., the minimum concentration at which the larvæ can first encroach on dusted surfaces—the tendency to overstep the margin became more and more evident. The adults pioneer this movement and may leave the main colony, crossing the dusted surface to some point in contact with the glass container where friction has removed portion of the original dust cover. They there reproduce to establish a colony in some fourteen days' time.

In the case of kaolin, the larval critical point with colonies of some fifty individuals lies just below the level of mass visibility, but adults may cross somewhat more easily even at higher concentrations.

A series of fruit specimens with colonies of various sizes demonstrated that both the size of the colony and the units of which it is composed, make the estimate of an effective minimum cover a matter of some difficulty. Large colonies in confined spaces, by sheer pressure of numbers, interfere with the distinctness of the margin between dusted and undusted parts of the fruit, insects coming in contact with the dust carrying off particles every time they move. The progressive attenuation of the cover in this region ultimately allows an extension of the pasturage of the thrips. The phenomenon is particularly evident when the individuals in the colony are mainly mature larvæ and adults.

In all this work the rust developing under observation accurately reflected the observed pasturage of the insects in both location and intensity.

The series of talc material gave essentially similar results, though the dust does not appear to be so effective as kaolin. The difference depends on the nature of the dust, for kaolin more effectively hinders free locomotion than does talc.

The promising nature of these laboratory trials prompted further elaboration in the plantation. The initial field work was based on the assumption that effective treatment of the plant prior to the throwing

of the bunch should reduce the infestation at the time of inversion. Hence attention was focussed on a series of stools in the Edgehill plantation which were expected to bear their first bunches during January and February, the dust cover being arranged so that some of the plants received a superfluity of dust and others the minimum practicable covering—a deposit just visible to the naked eye. In all cases it would be above the effective minimum cover determined in the laboratory. The inert dusts were applied to the throat of the plant at weekly intervals both before and after bunching, yet in no case was any apparent limitation imposed on the thrips, at least, not such as would markedly diminish the amount of rust on the fruit.

The initial infestation of the bunch remained as high as ever, for the adults invade the growing point of the plant within the cover of the furled leaf, a fact which was realised subsequent to these trials. The maintenance of a continuous dust cover over the surface of the fruit in a North Queensland summer proved rather difficult. It is then almost impossible to get an even cover over the whole surface of the fruits with even the greatest care, and the frequent rains break down the protection once it is made.

It would seem to follow, therefore, that the ordinary inert dusts can have little utility in the control of thrips unless applied in some manner which improves their adhesion to the plant—e.g., in spray media. If means could be devised to procure such adhesion, there seems little doubt that the insecticidal properties of the dusts would be as marked in the field as they have been in the laboratory.

[TO BE CONTINUED.]

## PUT CHILDREN ON THE LAND.

Because the return to prosperity will make a larger overseas market for Australian produce, the Archbishop of Brisbane (Dr. J. Duhig), speaking to a large gathering at Beaudesert recently, urged parents to settle their children on the land.

He added that the early commencement of a shipping service via Torres Straits would open up a great avenue for trade.

Speaking later at Canungra, the Archbishop said that he had been struck with the wonderful richness of the soil and great progress of the Canungra district. He considered the magnificent scenic grandeur of the adjacent National Park without peer in Australia. It was a great shame that this glorious mountain reserve, so handy to the metropolis, remained a closed book to 90 per cent. of the Brisbane people. If much of the relief labour which is being expended on chipping grass from the footpaths of Brisbane were employed in building roads to this great mountain resort, the results would be far more beneficial to the community, with increased tourist traffic. The Canungra Valley would easily support ten times its present population.

Mr. T. F. Plunkett, M.L.A., said he had first visited Canungra as a boy of 12 years, when it received one mail a week.

# Breeds of Poultry.

By P. RUMBALL, Poultry Expert.

IT is impossible in the space of this article to deal with all breeds, and reference will only be made to those that are used to any extent in this State for commercial purposes.

Commercial poultry may definitely be grouped in three classes, viz.:—

### Light Breeds.

Light breeds are usually breeds developed extensively for egg production with little or no attention being paid to table qualities. This class of bird may also be classed as a non-sitter. Among many strains individuals will be found in which the broody trait has not been bred out, but taken collectively they may be classed as non-sitters. Another character of the light breeds is that they are layers of white-shelled eggs.

Among this class Leghorns predominate, with probably the Ancona being the next most popular, followed by the Minorca.

### Heavy or Dual Purpose Breeds.

Breeds of this class have been developed for table and egg-producing qualities. Taken as a group they are not as efficient egg producers as the light breeds, but individuals of this class hold the record as egg producers in this State, namely, 354 eggs in 365 days. Without exception all heavy breeds are very docile, whereas light breeds are of a more or less nervous disposition. Breeds of this class may also be referred to as sitters. Every effort is made to breed this characteristic out, and it has been done with some considerable extent by many breeders, but in the best of flocks broody hens will be found. The egg of this class should be brown in colour, although many pale eggs will be found in all breeds.

The most popular breed of this class is the Australorp. The Langshan is probably the next in favour, followed by the Wyandotte, Rhode Island Red, and Sussex.

### Game Class.

This is essentially a table class. Although it may not prove profitable to breed Game fowls for table purposes, if it is found commercially sound to breed birds exclusively for the table the crossing of any dual-purpose fowl with the Game will add wonderfully to the table qualities of the progeny. This appears to the writer the most profitable manner to utilise the Game fowls.

Among the Game class is the Old English, Indian, and Australian Game.

## STANDARDS.

In order to maintain breed characteristics it is essential to have standards to which to breed. Thousands of fowls are bred yearly by producers with little or no consideration being given to type. The departure from type may be attributed to some degree to the exaggerated specimens at times seen on the show bench, and to greater consideration being given by judges to feather markings than to types and egg-producing qualities.

From the one breed in many instances there has been developed two types, namely the standard-bred fowl and the utility-bred fowl. In trying to perfect his bird from a show point of view the fancier sacrificed egg qualities, while the egg producer in the race to produce eggs sacrificed type. The egg producer sacrificed type to such an extent that commercial breeders years ago drew up a utility poultry standard to be read in conjunction with the standard of perfection as laid down by the Poultry Club of England.

This move has proved of great advantage to the industry, insofar as the improvement in type that has taken place has materially assisted in mantaining the health and stamina of our flocks.

## THE WHITE LEGHORN.

### The Cock—General Characteristics.

*Head.*—Skull fine; beak stout, the point clear of the front of the comb; eyes prominent; comb, single, perfectly straight and erect, large, but not overgrown, deeply and evenly serrated, the spikes broad at their base, extending well beyond the back of the head and following,

PLATE 137.—WHITE LEGHORNS.

without touching, the line of the head, free from "thumb marks" and side spikes; face, smooth; earlobes well developed and rather pendant, equally matched in size and shape, smooth, open, and free from folds; wattles long and thin.

*Neck.*—Long, profusely covered with hackle feathers.

*Body.*—Wedge shaped, wide at shoulders and narrowing to the root of the tail; round and prominent breast; slightly rounded back sloping to the tail; large wings tightly carried and well clipped up; moderately full tail at an angle of 40 to 45 degrees from the line of the back.

*Legs.*—Moderately long; shanks fine and round; flat shins objectionable; and free from feathers.

*Toes* (four).—Long, straight, and well spread.

*Carriage.*—Sprightly and alert.

*Weight.*—Not less than 6 lb.

### The Hen—General Characteristics.

With the exception of the comb (in the single-combed varieties falling gracefully over either side of the face) and the tail (carried closely and not at such a high angle) the general characteristics are similar to those of the cock, allowing for natural sexual differences.

*Weight.*—Not less than 4 lb.

*Colour.*—Beak, yellow or horn; eyes, red; comb, face, and wattles, bright red; earlobes, pure opaque white (resembling white kid) or cream, the former preferred; legs and feet, yellow or orange.

*Plumage.*—In white variety, white, free from straw tinge; principal varieties, white, brown, and black.

*Scale of Points for White.*—Head (comb, 12; lobes, 15), 27; colour, 25; type, 15; size, 15; condition, 10; legs, 8.

## THE ANCONA.

### The Cock—General Characteristics.

*Head.*—Skull moderately long, deep, and inclined to width; beak of medium length and moderate curve; eyes prominent; comb single, upright, of medium size, with deep serrations and five to seven spikes (broad at their base), the outline forming a regular convex curve, the back following the line of the head, free from "thumb marks" or side spikes; face smooth; earlobes inclined to almond shape, of medium size, and free from folds; wattles, long and fine.

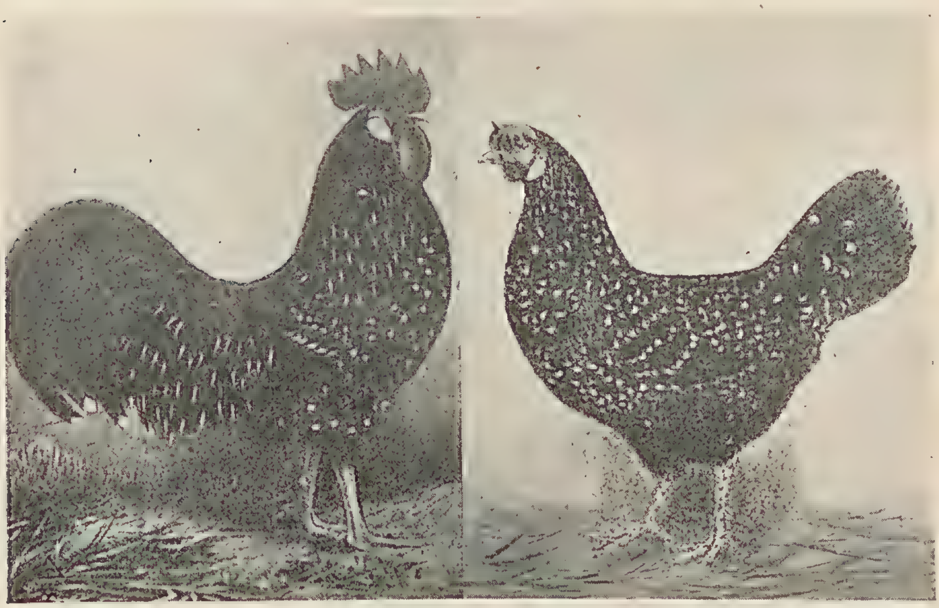

PLATE 138.—ANCONAS.

*Neck.*—Long, profusely covered with hackle.

*Body.*—Moderately long, with close and compact plumage; broad shoulders and narrow saddle; full, round breast carried upwards; large wings well tucked up; full tail carried well out.

*Legs.*—Moderately long, thighs well apart and almost hidden by the body feathering; shanks and feet free from feathers; toes (four) rather thin, well spread.

*Carriage.*—Upright, bold, and active.

*Weight.*—From 6 lb. to 7 lb.

### The Hen—General Characteristics.

With the exception of the single comb, which falls with a single fold and partly hides one side of the face, the general characteristics are similar to those of the cock, allowing for the natural sexual differences.

*Weight.*—From 5 lb. to 6 lb.

*Colour.*—Beak yellow, shaded with black or horn, preferably not wholly yellow; eyes, orange-red with hazel pupil; comb, face, and wattles, bright red, the face free from white; earlobes, white; legs and feet, yellow, mottled with black.

*Plumage.*—Beetle-green with white tippings (the latter free from black or grey streaks). The more evenly V-tipped throughout with white the better, but tipped and not laced or splashed. Undercolour black. All feathers should be black to the roots, with beetle-green surface, and only the tips white.

*Scale of Points.*—Colour and markings (purity of white, quality of evenness of tipping, 20; beetle-green ground colour, dark to skin, 15; tail, 15), 50; head (comb, 10; eyes, 5; beak, 5; lobes, 5), 25; type, 10; legs, 5; condition, 5; size, 5.

## THE MINORCA.

### The Cock—General Characteristics.

*Head.*—Skull sufficiently long and broad to provide a substantial foundation for the comb. Beak stout, fairly long; eyes full, bright and expressive; comb single, medium size, perfectly straight, upright, and firm, not extending over the front of the beak, the back following without touching the line of the neck-hackle, nicely arched and evenly serrated with preferably five wedge-shaped spikes, free from "thumb marks" or side sprigs; face, smooth, the skin taut (wrinkles objectionable), as free as possible from feathers or hairs; earlobes almond shaped, medium size, of kid-glove texture, flat, and of firm substance, fitting closely to the head and not extending over the face, and without any tendency to hollowness, slackness, or roundness; wattles long, of oval shape, and fine texture.

*Neck.*—Long hackle, extending well down to body.

*Body.*—Broad shouldered, deep, square and compact, with a deep keel and straight breast bone; horizontal carriage; rather long back; full, round breast; medium length wings, carried closely to the sides and with broad flight feathers; fully furnished tail with long broad and nicely curved sickles, and carried well back.

*Legs.*—Of medium length, but without any tendency to stiltiness; shanks strong, but fine bone, free of feathers, straight and wide apart, no tendency to "knock-knees"; toes (four), long, fine, and well spread.

*Carriage.*—Upright, active, and alert.

*Weight.*—7 lb. to 8 lb. Cockerels, 6 lb. to 7½ lb.

Plate 139.—Black Minorcas.

**The Hen—General Characteristics.**

With the exception of the single comb (which is carried over one side so as not to obstruct the sight) the lobes, which should not exceed 1½ inches long and 1 inch wide, and the tail (neatly closed and carried well back), the general characteristics are similar to those of the cock, allowing for the natural sexual differences.

*Weight.*—6 lb. to 7 lb.; pullets, 5 lb. to 6 lb.

*Colour.*—Beak, dark horn; eyes, black or dark hazel; comb, face, and wattles, blood red; earlobes, perfectly white; legs and feet black or very dark slate, the latter in adult birds only.

*Plumage.*—Brilliant green-black.

*Scale of Points.*—Head (face, 15; comb, 15; lobes, 15), 45; colour plumage, 10; legs, eyes, and beak, 10), 20; type, 15; size, 10; condition, 5; breastbone, 5.

**THE AUSTRALORP.**

Queensland standard, as adopted by the Australorp Society, the National Utility Poultry Breeders' Association (Queensland Branch), and the United Poultry Club of Queensland.

*Head.*—Medium in size; skull fine with no fullness over the eyes; beak of medium length, strong and slightly curved; colour, black—5 points.

*Eyes.*—Full, prominent and expressive, dark brown iris, the darker the better—5 points.

*Comb, Wattles, and Lobes.*—Medium size, smooth and fine in texture; bright red in colour; comb erect, evenly serrated and following the curve of the head; wattles neatly rounded; lobes well developed—5 points.

*Face.*—Bright red, fine, not sunken, and as free from feathering and wrinkles as possible—5 points.

*Neck.*—Medium length; slightly curved and profusely feathered.

*Body, Skin, and Abdomen.*—Body deep, broad backed and of good length, breast of medium depth, broad and nicely rounded, keel straight and of moderate length, the whole giving a well-balanced appearance; wings well formed and carried close to body; skin, white, texture of finest quality. The abdomen to be elastic and full but avoiding indications of excessive fat or abdominal weakness—35 points.

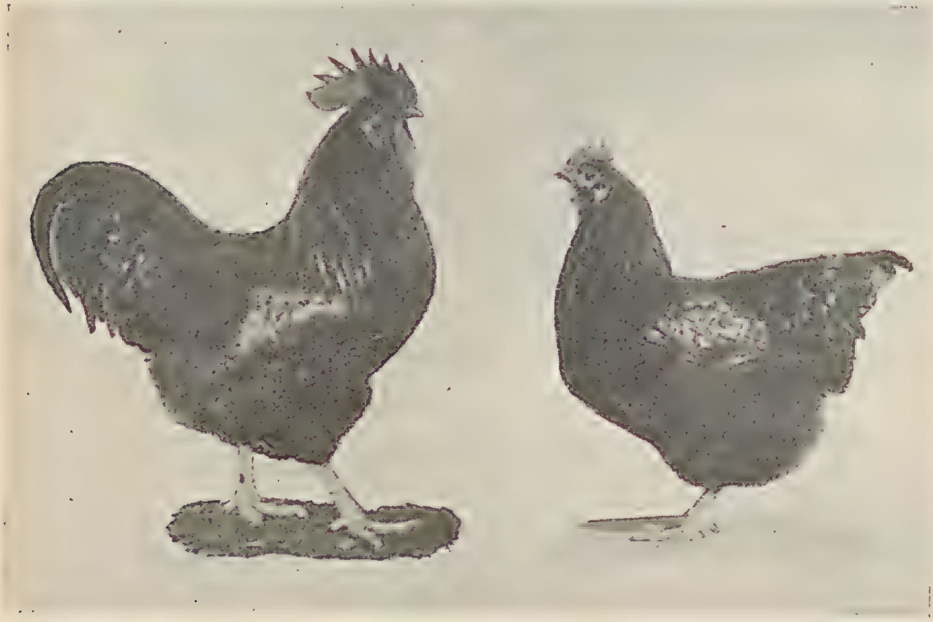

PLATE 140.—AUSTRALORPS.

*Tail.*—Medium length, angle about 35 degrees in the male and 20 degrees in female—5 points.

*Legs.*—Medium length, strong and wide apart; shanks fine in bone and scale, free from feather or fluff; toes straight and well spread; legs and upper portion of feet slate to black; sole of feet white—5 points.

*Plumage.*—Soft, close, avoiding fluff and looseness; colour black, with green sheen—7 points.

*Condition.*—As indicated by general health, cleanliness of feathers and legs—10 points.

*Carriage.*—Erect and graceful—that of an active bird—10 points.

*Weight.*—Cockerel, 7 lb. to 8 lb.; cock, 8 lb. to 9 lb.; pullet, 5 lb. to 6 lb.; hen, 6 lb. to 7 lb.—5 points—Total, 100 points.

*Disqualifications.*—Side sprigs, any deformity.

*Serious Defects.*—White in lobes.

## THE LANGSHAN.

### The Cock—General Characteristics.

*Head.*—Skull, small and full over the eyes. Beak, fairly long, and slightly curved. Eyes large. Comb single, medium size, straight and upright, free from side sprigs, evenly serrated, with five or six spikes of even texture; earlobes, small and well-rounded. Face smooth, of fine texture, and free from feathers. Wattles of medium size and fine in texture.

*Neck.*—Of medium length with a full flowing hackle.

*Body.*—The back fairly broad, flat, of medium length, saddle abundantly furnished with hackles. Breast fairly deep and well-rounded from shoulder to shoulder, not flat; breast-bone straight, with keel level. Wings of medium length, closely carried.

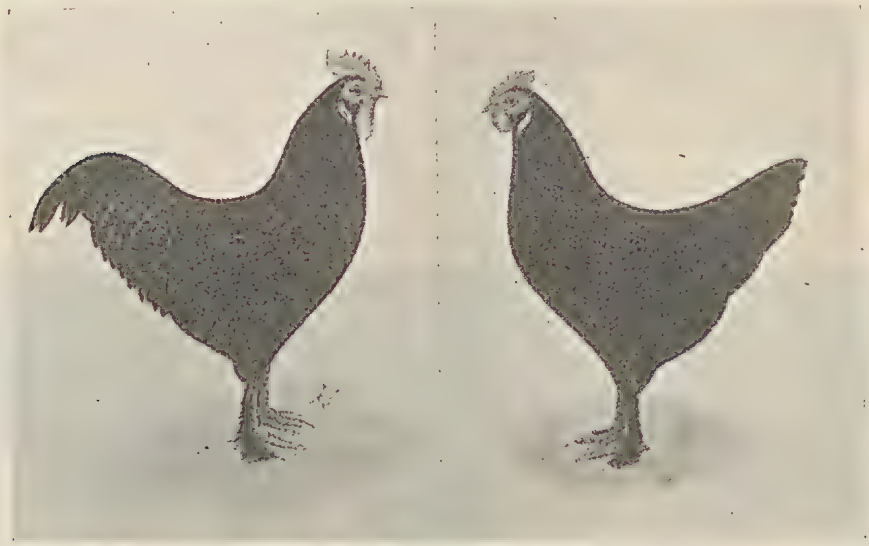

Plate 141.—Australian Langshans.

*Tail.*—Of medium size, carried gradually up and outwards to an angle of about 35 degrees, and medium width, fairly close, furnished with plenty of tail coverts and two secondaries and two sickle feathers slightly longer.

*Legs.*—Thighs medium length covered with short soft feathers. Shanks of medium length, small boned, standing well apart and feathered down the outer sides (not too heavily or too scantily).

*Feet.*—Toes, four, straight, slender and well spread, the outer toe being feathered.

*Carriage.*—Graceful, neat, and extremely active.

*Plumage.*—Not too tight like the Game, not so loose as Cochin.

*Weight.*—Cock, $6\frac{1}{2}$ to 8 lb.; cockerel, $5\frac{1}{2}$ to 7 lb.

### The Hen—General Characteristics.

With the exception of the fluff, which should be slightly more, the general characteristics are similar to those of the cock, allowing for the natural sexual differences.

*Weight.*—Hen, 5½ to 7 lb.; pullet, 4½ to 6 lb.

*Colour.*—Beak light to dark horn, not white. Eyes dark brown to hazel. Wattles and earlobes to be brilliant red. Legs and feet blue-black, showing pink between the scales, the web and bottom of the feet pink-white (the deeper the pink the better). Toe-nails white.

*Plumage.*—Dense black with a bottle-green gloss free from purple or blue tinge, medium texture.

*Scale of Points.*—Type, 15; colour, 15; head, 11; legs and feet, 11; condition, 11; skin (thin) flesh (white), 11; bone (fine), 11.

## WHITE WYANDOTTE.

### The Cock—General Characteristics.

*Head.*—Skull short and broad; beak short and well curved. Eyes large and bright. Comb rose, firmly and evenly set, low, square-fronted, gradually tapering towards the back and terminating in a well-defined spike (or leader) which should follow the curve of the neck without any upward tendency; the top of it oval and covered with small rounded points, the side outline being covex to conform to the shape of the skull. Wattles of medium length, fine and well-rounded.

*Neck.*—Of medium length, abundantly covered with hackle.

PLATE 142.—WHITE WYANDOTTES.

*Body.*—Short and deep, with well-rounded sides; broad round breast with straight keel; short back with full and broad saddle rising a concave sweep to the tail. Wings of medium size, well folded; tail well developed, spread at the base, the main feathers carried rather upright, the sickles of medium length.

*Legs.*—Of medium length. Thighs well covered with soft and webless feathers, the fluff full and abundant. Shanks strong, fine, well rounded, and free of feather or fluff. Toes (four), straight and well spread.

*Carriage.*—Graceful and well balanced, somewhat resembling the Brahma.

*Weight.*—Not less than 8 lb.

### The Hen—General Characteristics.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

*Weight.*—Not less than 6 lb.

*Colour.*—Beak, bright yellow (except Buff Laced, yellow or horn tipped with yellow; Columbian, yellow or horn; Gold Laced, Partridge, Silver Laced, and Silver Pencilled, horn shading into or tipped with yellow). Eyes bright bay. Comb, face, wattles, and earlobes, bright red. Legs and feet, bright yellow.

*Plumage.*—In white variety, pure white, free from yellow or straw tinge.

*Principal Varieties.*—White, Columbian, and Silver Laced.

*Scale of Points.*—The White: type, 25; colour, 25; size, 15; head, 15; legs, 10; condition, 10.

## THE RHODE ISLAND RED.

### The Cock—General Characteristics.

*Head.*—Skull strong, but not thick. Beak curved, moderately long. Eyes large and bright. Comb (single) medium size, upright, straight, and firmly set with five even serrations. Face smooth. Earlobes fine texture, well developed, and pendant. Wattles of medium size and moderately rounded.

*Neck.*—Of medium length and profusely covered with feathers flowing over the shoulders, but not too loosely carried.

*Body.*—Fairly deep, broad and long, but a distinct oblong rather than square; broad and full breast; long back, horizontal except where neck-hackle flows over the shoulders and the saddle gently rises; large wings well folded and the flights horizontal; fairly small tail, sickles passing a little beyond the main feathers well spread and carried somewhat low (but by no means drooping) to increase the apparent length of the bird.

*Legs.*—Of medium length; large thighs; well-rounded shanks, free of feathers. Toes (four) straight, strong and well spread.

*Carriage.*—Upright and graceful.

*Weight.*—8 lb.

### The Hen—General Characteristics.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

*Weight.*—6 lb.

*Colour.*—Beak, red-horn or yellow. Eyes, red. Comb, face, ear-lobes, and wattles, brilliant red. Legs and feet, yellow or red-horn. A line of red pigment down the sides of the shanks is desirable.

*Plumage of Cock.*—Hackle red, harmonising with back and breast. Wing: primaries, lower web black, upper red; secondaries, lower web red, upper black; flight coverts, black; bows and coverts, red. Tail (including sickles) black or green-black; coverts mainly black, but may be russet or red as they approach the saddle. Remainder, general surface rich brilliant red, except where black is specified, free from shafting, mealy appearance, or brassy effect; depth of colour (red) is slightly accentuated on wing bows and back, but the least contrast between these parts and the hackle or breast the better; an harmonious blending desirable. The bird should be of so brilliant a lustre as to have a glossed appearance. The undercolour and quills of the feathers should be red or salmon. With the saddle parted showing the undercolour at the base of the tail, the appearance should be red or salmon, not white or smoke. Black or white in the undercolour of any section is undesirable. Other things being equal, the specimen having the richest undercolour shall receive the award.

PLATE 143.—RHODE ISLAND REDS.

*Plumage of Hen.*—Hackle, red, the tips of the lower feathers having a black ticking but not a heavy lacing. Tail, black or green-black. Wings as in the cock. Remainder general surface lighter and more even than in the male, free from shafting or mealy appearance and except where black is specified, a rich even shade of bright red, not as brilliant a lustre as the male. The undercolour and quills of the feathers should

be red or salmon. Black or white in the undercolour of any section is undesirable. Other things being equal, the specimen having the richest undercolour shall receive the award.

*Scale of Points.*—Colour (plumage, &c., 25; eyes, 8), 33; type, 30; head, 10; size, 10; condition, 10; legs, 7.

## THE LIGHT SUSSEX.

### The Cock—General Characteristics.

*Head.*—Skull of medium size. Beak, short and well curved. Eyes, full and bright. Comb, single, of medium size, upright, evenly serrated, and fitting closely. Face smooth. Earlobes and wattles of medium size.

*Neck.*—Of medium length, with fairly full hackle.

*Body.*—Broad, deep, and long; square breast and carried well forward with long and deep breastbone; wide shoulders; broad and flat back. Wings carried closely. Tail of moderate size, carried at an angle of 45 degrees.

*Legs.*—Short and rather wide apart, the thighs stout, and the shanks strong and free from feathers. Toes (four) straight, long, and well spread.

*Carriage.*—Graceful and erect.

*Plumage.*—Close.

*Weight.*—9 lb.

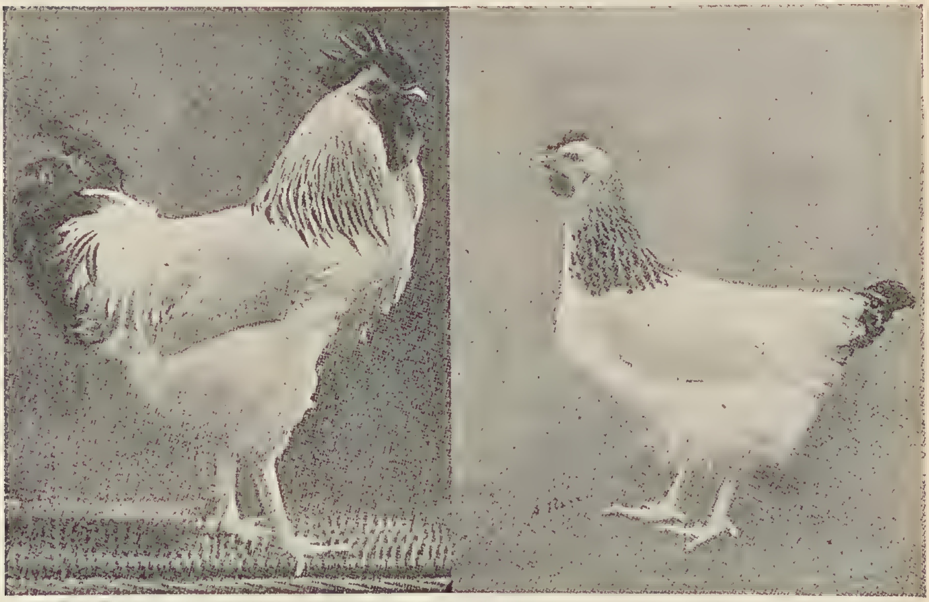

PLATE 144.—LIGHT SUSSEX.

### The Hen—General Characteristics.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

*Weight.*—7 lb.

*Colour.*—Beak, white or horn. Eyes, red, except in Lights, orange, and in Browns, brown or red. Comb, face, wattles, and earlobes, red. Legs and feet, white. Flesh and skin, white.

*Plumage.*—The Light, pure white with black striped hackle, black in flights, and black tail, the black centre of each feather of the neck hackle to be entirely surrounded by a white margin, and finished in a decided white point, not a black tip or black outer edging.

*Principal Varieties.*—The Light, Red, and Speckled.

*Scale of Points.*—Type, 25; size, 20; colour, 20; legs and feet, 15; head, 10; condition, 10.

### Utility Poultry Standard.

Type; colour (plumage and lobes); legs and feet (colour); condition—health, furnishing brightness and cleanliness of feather and legs; in accordance with the accepted standard of the breed.

*Laying Characteristics, any Breed.*

*Conformation*—

(*a*) Length, depth, width, proportionate to type of breed.

(*b*) Length as taken from base of the neck to base of the tail.

(*c*) Depth to be determined by the vertical space between the back and the breast-bone and the pelvic bones.

(*d*) Width as measured across the saddle and immediately behind the wings as is indicated by the distance apart of the legs.

*Freedom from Coarseness*—

(*a*) Shanks strong, as differentiated from either extreme coarseness of bone.

(*b*) Pelvic bones strong at base; long, fine, and straight.

(*c*) Tissue—pelvic bones to be free as possible from gristly covering.

*Head.*—Finely modelled; skull deep over eyes, full and round at back.

*Eyes.*—Full, bright, and expressive.

*Face.*—Bright, lean, free from feathering, and not sunken.

*Comb and Wattles.*—Neat, fine in texture, and medium size, avoiding "beefiness."

*Neck.*—Fine and fairly long.

*Skin and Abdomen.*—Texture of skin to be of the thinnest and finest quality and pliable; abdomen to be elastic, avoiding sagging-in, or fullness indicating excess of fat.

*Plumage.*—Feathers soft and silky, close, but not hard as in game; fluff moderate.

*Weights.*—Light breeds, ½ lb. to 1 lb. above minimum, and heavy breeds 1 lb. to 1½ lb. above two score maximum points; if in excess to be cut correspondingly.

### Minimum Weights.

*Light Breeds.*

Leghorns, Minorca, Andalusians, Spanish, Campines, Buttercups, Anconas: cockerel, 5 lb.; pullet, 4 lb.

Hamburg: cockerel, 4 lb.; pullet, 3 lb.

*Heavy Breeds.*

Orpington, Plymouth Rock, Rhode Island Red, Sussex: cockerel, 7 lb.; pullet, 5 lb.

Langshans, Wyandottes: cockerel, 6 lb.; pullet, 4½ lb.

Any other variety: cockerel, 7 lb.; pullet, 5 lb.

*Scale of Points.*

*Standard Points.*—Type, maximum points, 20; colour (plumage and lobes, 7); legs and feet (colour), 3; condition, 5.

*Laying Characteristics.*—Conformation (indicating stamina and capacity), maximum points, 20; freedom from coarseness, 5; head, 7; eyes, 7; face, 6; comb and wattles, 5; skin and abdomen, 5; plumage, 5; weight, 5; total, 100.

*Disqualification.*—Under weight, wrytail, any indications of impurity of breed, dubbing, and faking.

## ECONOMY IN POULTRY FEEDING.

On some farms a good deal of wastage of food occurs through faulty feed hoppers in cases where dry feed is given, while in other instances the over-feeding of wet mash results in much wastage. These are directions in which a little care would result in a saving without affecting egg production.

One of the common faults with the dry-feed hoppers is that they permit of the food being easily scratched out. A suitable type of hopper is illustrated in the department's free leaflet on the feeding of poultry. Where wet mash is used it is important that it be mixed to a consistency that will be neither too flaky nor too wet. If too much bran is used the mash will not hold together and can easily be scratched about the pen by the birds, and when this occurs it soon becomes dried up and is not eaten.

Another reason why on many farms the mash is fed in a very flaky condition is because the ingredients are mixed together before wetting them, instead of scalding the bran first and then mixing in the pollard. This latter method results in a far more satisfactory and appetising mash. For the adult birds the mash should be wet enough to adhere together under pressure with the hands, yet should not be sticky and should break apart when dropped into the feed troughs.

The quantity to be given will vary according to the rate of production and the weather, but the birds should have as much as they will consume within an hour without leaving any of the food scattered about. It will usually be found that what is not eaten in that time will be scratched about the pens and much of it wasted. Apart from that aspect, if given too much feed the birds become surfeited with food and production suffers.—A. and P. Notes, New South Wales Department of Agriculture.

# THE EXPORT OF PORK PRODUCTS.

By Mr. E. J. SHELTON, Senior Instructor in Pig Raising.*

REVIEWING the export of pork products from Australia, and from Queensland in particular, it is of interest to note that considerable attention has been given recently to the development of overseas outlets for Queensland's pig products, and appreciable numbers of pork carcasses have found ready sale on the markets of the Old World at rates that have proved acceptable, although on a much lower range than is normal or desirable on both markets.

Our exports, however, are small in comparison with the exports of older countries, and statistics cannot be used to much advantage in a general discussion of this important subject, especially if an attempt is made to draw comparisons to emphasise the importance of this industry.

For the two-year period 1931-32, a total of 162,160 pork carcasses (inclusive of porkers and baconers) were despatched from Australia to the United Kingdom, Queensland's share of these exports being 105,250 carcasses, by far the largest number consigned from any State in the Commonwealth.

In 1932, owing to shortage of supplies here and to the low range of prices offering overseas, our exports eased off considerably; although trade interests still maintain their position on the markets referred to and indications are that the future will see a very appreciable advance in these exports, especially if prices improve in Great Britain and trade can be effectively organised and maintained.

Queensland pig-raisers will be interested to know that there appears to be an assured market for a substantial increase in shipments of frozen pork, and with the co-operation of the Queensland Meat Industry Board and other exporting firms the future of this trade is bright.

Experiments in the shipment of beef in a chilled (not frozen) form are now engaging the attention of specialists of the Council for Scientific and Industrial Research, and there would appear to be good reason for believing that in the future some progress along similar lines may be made with pork.

Unfortunately, for the past few months prices for pig products in the United Kingdom have been much lower than usual, but with the approach of winter there the price position has improved and is reflected in a slightly higher value here for porkers than baconers.

The most popular trade weights for export porkers and for heavier pigs to be manufactured into bacon in the United Kingdom are as follows:—

Export porkers, prime-quality pigs 60 to 100 lb. dressed weight, with a decided preference for pigs from 60 to 80 lb. dressed.

Export baconers, good-quality stock from 100 to 140 lb. dressed, with a preference for pigs slightly above the average for local trade in this State.

The export of heavier weight carcasses should also be of distinct value to producers here, for with abundant supplies of wheat, barley, maize, dairy by-products, and concentrates (including meat meal), that impetus to increased production so desirable would be provided.

It is satisfactory to note the steadily improving value of Australian pork and bacon pigs in Great Britain and to know that we can now average a higher price than is obtained for similar carcasses from New Zealand, one of our keenest competitors. It has been noted by the Queensland Meat Industry Board that with many pigs treated at the abattoir, there is room for improvement in type or finish or in both. Producers should, therefore, whole-heartedly embrace the opportunity offered by the Pig Improvement (Better Boar) Scheme of the Department of Agriculture and Stock to improve the quality of their pigs by the introduction of boars of white skinned breeds (Large White and Middle Whites); and by giving the pigs better care and attention, particularly at the critical stages in their development—viz., birth, weaning, and marketing.

The next step is organisation of supplies and placing of the export trade on a definite basis of expansion, so as to ensure continuity of supply and extension of overseas outlets.

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* In a radio lecturette from 4QG.

Plate 145.

Size with refinement is shown by this Large White sow, which won a championship at Brisbane Exhibition 1933. She is Pine Terrace Iris and was imported from New Zealand by the Kingston Pig Farm Company in 1930. Her length and leanness indicate typical bacon characteristics.

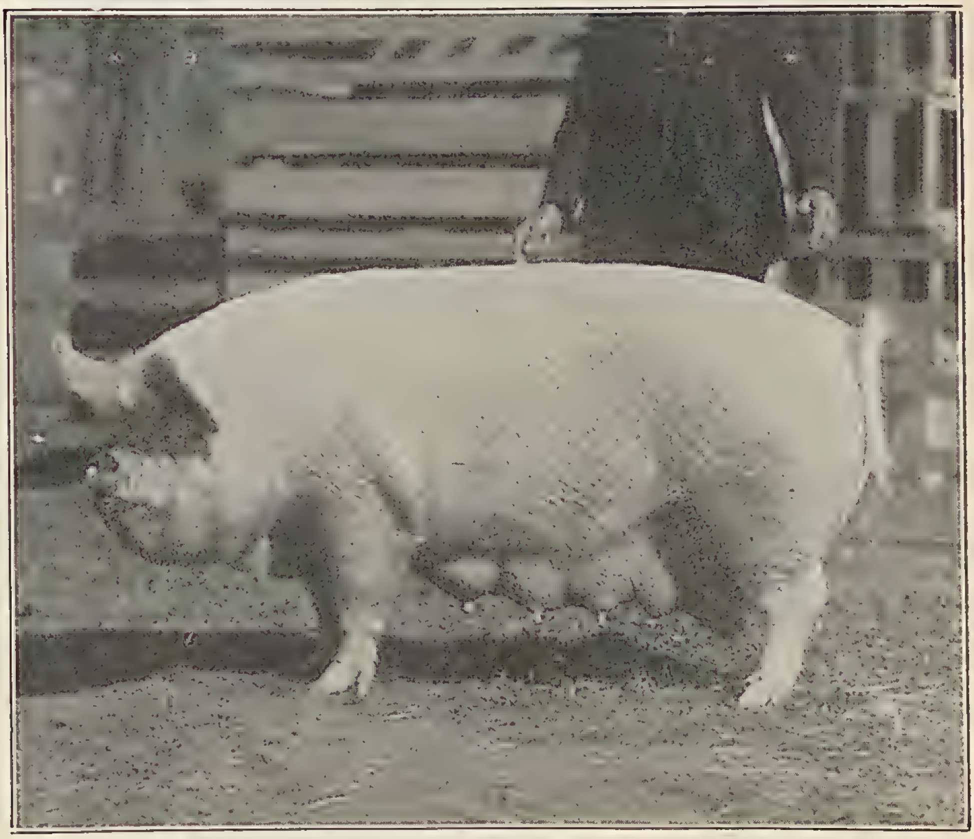

Plate 146.

This typical Middle White sow was a prize winner at Australian shows. She carries that fleshiness and compactness so necessary for the production of well finished light-weight porkers.

**Markets in the East.**

It has not yet been possible to extend trade in the East beyond an ordinary average for the period through which we are passing, but with increased supplies of suitable stock available there is no reason why this trade should not grow. Stabilisation of price and orderly marketing are very necessary, and it is possible that at no very distant date a definite scheme along these lines will be placed before those concerned in this and the other States.

Speaking of organisation, it is well to remember that in developing market outlets for the products of the farm five distinct sections of the community have to be taken into consideration—the producer, the wholesale buyer, the retailer, the exporter, and the consumer.

The producer naturally looks to buyers and consumers for market outlets for the stock he has available, and it is but natural that both these sections of the trade should have some say in the type, quality, and weight of the pigs required. As it happens, there has been a definite change-over throughout the world from the heavier fatty type of animal so popular years ago to a carcass of more modest proportions. There is now no demand at all for heavy, fat meat of any description. Consumers the world over demand lightweight, fleshy, attractive, and appetising meat at a reasonable price, and at an early age so far as the animal is concerned.

This means that, where the change has not been effected on the farm, it is essential that the producer should become fully conversant with trade requirements and should so arrange methods of production to be able to cater for present day demands. Generally speaking, in the absence of consumer demand the buyer is not so much concerned with detail, buyers generally have little or no time for technical detail, claiming that it is the business of the producer to market his stock exactly in accordance with trade demands.

The exporter must, of necessity, be more attentive to detail than the local distributor, for competition in the markets of the Old World is even keener than it is on local markets; moreover, buyers in the Old World have supplies offering from many different countries. They can pick and choose as they feel inclined, and can well afford to refuse trade with producers who will not cater for their exacting demands. Retailers generally aim at satisfying the requirements of their customers and, in this connection, exporters of pork products have to satisfy a very exacting demand from retailers overseas where the consuming public is much more numerous and where there is a very wide choice. Producers here would, therefore, be well advised to co-operate whole-heartedly with departmental authorities and with exporters in organising the export trade and in emphasising the importance of export outlets.

PLATE 147.

A long-bodied fleshy pig of export bacon type. Note even development and absence of flabbiness which is general in pigs carrying a lot of Large White breeding.

Apart from colour (and in this there certainly is a decided preference for a white skinned export porker) there are other features that should be regarded as essential in building up an export trade. The type of pig required must receive first consideration. The long-bodied fleshy pig from whose carcass a maximum of nutritious pork chops can be secured is the one in most popular demand; the long-bodied, clean, well-dehaired white finished carcass secures maximum in a scale of points. The pig must be neat and attractive with fine, comparatively short legs, and well-rounded hams covered with a minimum of fat. The hams in a porker are not quite as important as in a baconer, for they are sold in a fresh and not in a cured form. The loins need to be lengthy with a large proportion of flesh, and only a reasonable covering of fat. The sides and belly should be deep and well streaked with lean, while carrying a reasonable proportion of fat. As with pigs for other sections of the trade the head, neck, and shoulder should be as light as possible, as the forequarter, generally, is the cheapest portion of the body from a retailer's point of view.

The ideal porker is one that not only fills this specification, but one that is produced in a minimum of time with the least waste possible and at the lowest cost of production. The carcass must be free of bruises and blemishes, such as those caused by improper fire branding. With regard to the questions of breed, one feels perfectly safe in discussing such types as the Middle White, the Berkshire and their crosses, and crosses with a fleshy type like the Tamworth and the Large White particularly, for the heavier type of porker.

For export baconers, it is probable that the Large White and its crosses with the Middle White, the Berkshire and the Tamworth, will be much sought after, while the Tamworth-Berkshire cross for local trade requirements still holds a very important place and continues to prove acceptable on the overseas markets.

Plate 148.

Ideal light-weight porkers for export. These pigs, which were exhibited by the Dinmore Stud Piggery, won first prizes in the live and dressed forms in the Toowoomba Show pork carcasses contest 1933. Their breeding is Middle White x Berkshire.

Of other breeds still in the experiment stage in this State, one might refer to the Wessex Saddleback as a British breed with a good reputation overseas.

One must not forget that there is truth in the old saying that half the breeding is in the feeding and in the care and management of the pigs before and after their birth, for the very best of breeds can be absolutely ruined by improper feeding and handling.

We need also to consider the value of co-operative effort in the handling of supplies, for much needless expense may be incurred by the transport of railway wagons only partly filled with market stock.

The inspection of carcasses for the overseas trade is very strict, and many otherwise suitable carcasses are rejected because of being disfigured by large and unsightly fire brands.

Here is emphasised the very great advantage of the system of identification referred to as body-tattooing, a new system that promises to take the place of fire branding, paint marking, or other methods of identifying stock.

Let me add, in conclusion, that the Department of Agriculture and Stock stands prepared to co-operate whole-heartedly with every section of the community in the development of primary and secondary industries, and in the production of stock suitable for export trade.

The Better Boar Subsidy Scheme offers one form of financial assistance in the purchase of approved sires; the educational activities of the Department pave the way for the farmer to gain all the information required to enable him to market the correct type of stock, while the various organisations with which the Department co-operates are actively engaged in building up market outlets, and assuring for the producer a market for his stock at rates that compare more than favourably with those obtained in other countries for a similar class of stock.

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# NEW HIGHWAYS IN QUEENSLAND.

## THE WORK OF THE MAIN ROADS COMMISSION.

*The Twelfth Annual Report of the Commissioner of Main Roads, Mr. J. R. Kemp, commends itself strongly to all concerned with the progress of country life in Queensland. This survey of a year's achievements leaves the impression that the Main Roads Commission is one of the most important factors in our rural development. It is a record of well-organised work, and, through the courtesy of the Commission, we are able to reproduce a series of excellent illustrations of that work, and which indicate the immense value of a great community service.—Editor.*

THE history of roadmaking is the history of civilisation. The march of progress would have been impossible without the broad highway linking farm with hamlet, hamlet with village, village with town, town with city, and city with the countries of the world. Our literature is enriched with references to the road, convenient metaphors expressing human action and progress, and even stressing moral values. Thus we have "the straight and narrow path," "the beaten track," "the accustomed way," "the sunshine route," "the wandering trails," and the "broad road that leadeth to perdition."

Writing on this theme, Hilaire Belloc observes that 'the road is one of the great fundamental institutions of mankind . . . Not only is the road one of the great human institutions because it is fundamental to human existence, but also because its varied effect appears in every department of the State. It is the road which determines the sites of many cities, and the growth and nourishment of all. It is the road which controls the development of strategies and fixes the sites of battles. It is the road that gives its framework to all economic development. It is the road which is the channel of all trade, and what is more important, all ideas. In its most humble function it is a necessary guide without which progress from place to place would be a ceaseless experiment; it is a sustenance without which organised society would be impossible; thus, and with those other characteristics I have mentioned, the road moves and controls all history."

As a factor in the building of our own rural civilisation the importance of the work of the Main Roads Commission is widely recognised, and its annual report, from which the following extracts are taken, contains much of interest for all concerned with the development of a richer country life in Queensland.

### DEVELOPMENTAL WORKS.

During the year considerable progress has been made in extensive developmental undertakings which have been initiated, especially in the North. Some of the more important projects are briefly described hereunder:—

#### The Palmerston Area.

In order that that portion of the Palmerston area (North Queensland) lying between the Beatrice River and the "K" Tree should be opened as early as possible, a grant of £10,000 was made available to the Commission. The construction of the road leading from the McHugh Bridge over the Beatrice River has been expedited, and provision has been made for metalling in order to allow more economical transport of the timber from this area which the Forestry Department will log out prior to dairying settlement.

The main road has been so designed as to provide direct access to approximately 75 per cent. of the blocks, thus greatly minimising the amount of pioneer access roads to be built by the Lands Department. The completion of this work should mark a new era in tropical land settlement, the main road being first constructed with the design of blocks based thereon. Some 10,000 acres will thus be made available in this area.

The opening of the McHugh Bridge by the Minister for Public Works, Hon. Harry A. Bruce, in September, 1932, in the presence of a large gathering representative of the Tableland areas and of the coastal areas from Cairns to Innisfail, was

regarded as an important event in the progress of North Queensland, and a number of motor cars from the coastal area negotiated the difficult temporary connecting track between the "K" Tree and the bridge. This bridge is situated just below the junction of the Beatrice and Little Beatrice Rivers, and its surroundings present a scene of almost unrivalled beauty, with mountain streams pouring in rapids over granite boulders through tropical jungle. The bridge was constructed largely by unemployed relief work under the supervision of Shire Engineer Macarthur, directed by the then Northern Engineer of the Commission, the late Mr. J. M. Fraser.

The new road now in process of construction is located so as to contour the spurs on easy grades between the Christy Palmerston track and the North Johnstone and Beatrice Rivers.

Works are also proceeding rapidly in the East Palmerston area with access to Innisfail. The land of that area is rich red volcanic soil, covered with tropical jungle, and comprises an area of approximately 10,000 acres.

### Maalan, Culpa, Boonjee, El Arish, and Julatten Areas.

The policy of developing the above areas on similar lines to the Palmerston has now been approved, and surveys and construction to that end are proceeding.

The Culpa area, which the Government proposes to open, comprises an area of some 50,000 acres, and its access is naturally to Ravenshoe by a road which will shortly be under construction via the Tully Falls, which rank in grandeur with the Barron Falls. This road, in addition to developing large areas, should greatly assist the tourist trade of North Queensland.

### Mount Spec Road.

This work has proceeded steadily by unemployed relief labour in continuation of the work inaugurated by the previous Government. The photograph illustrating the construction of an arched masonry bridge at Little Saltwater Gorge is an illustration of the high quality of work which can be achieved by such labour skilfully directed.

### Chinchilla, Wondai, Mundubbera, and Millmerran Areas.

The work of clearing roads to serve these areas was undertaken by the Shires concerned, under the direction of the Commission, with State and Commonwealth funds for the relief of unemployment, which were provided upon the recommendation of the State Employment Council previously referred to. Very little of the work was actually upon declared main roads, but upon feeder roads thereto.

A total of 287½ miles of road was so cleared, and in some instances roughly graded, for an amount of £21,915 18s. The country served comprises brigalow and belar lands previously heavily infested with prickly-pear. A considerable mileage of similar work in the Millmerran area has been cleared by the Lands Department, and the survey of the main roads in that area is proceeding.

### Eungella Lands.

An agreement has been reached with the Lands Department that the first section of the main road which junctions with the Eungella Range road shall be constructed by the Public Estate Improvement Branch of that Department in accordance with the surveys, plans, and specifications of the Commission, the Lands Department carrying on the work in conjunction with its pioneer feeder roads. The Mirani Shire Council has agreed to this arrangement.

### Hervey's Range Road.

A continued agitation by tobacco growers for a road of access up the Hervey's Range, near Thornton's Gap, was met by the Government granting special funds under section 19 of "*The Main Roads Acts*, 1920 *to* 1929," to the extent of £14,500. It has been possible to provide only a narrow one-way traffic road on easy gradients.

The declaration of the range section as a main road before construction was not considered reasonable in view of the obligations upon the Main Roads Fund and the Shire of Thuringowa. Since construction, however, the road has been taken over as a main road, thus ensuring its proper future maintenance.

### Relief to Local Authorities.

It is proposed that, under section 33 of "*The Main Roads Acts*, 1920 *to* 1929," the local authorities shall be relieved of interest and redemption payments for some years in the case of the opening of virgin tropical lands, such as Culpa, Maalan, Palmerston, and Eungella.

In the case of the Culpa lands, it is considered that special funds should be provided under section 19 of the Main Roads Acts for construction work beyond Tully Falls in view of the large area to be developed.

## STATE HIGHWAYS.

### Pacific Highway.

The Government approved of the completion of certain works on State highways, and as a result the sections of the Pacific Highway between Southport and Beenleigh, some 8 miles in length, were completed in approximately six months, while the Currumbin deviation, which removes the highway from the narrow and unstable Currumbin sea-front, is well under way.

### Lockyer-Darling Downs Highway.

Sections of this highway on the Darling Downs have been rapidly completed, and the programme of construction for the year 1933-34 provides for further works, both on the Downs and on the Lockyer.

### Darling Downs-Burnett Highway.

The Darling Downs-Burnett Highway (Kingaroy-Bell section) is now completed in Kingaroy Shire, with the exception of such surfacing work as may become necessary from time to time.

Extensive works between Porter's Gap and Bell have been completed, and further works are in hand and projected. The total cost of construction of the completed highway will represent only about one-third of the estimated cost of the once projected railway, whilst at the same time the road has allowed of more intensive local development in the adjacent area than would have occurred if a railway had been built. The main road revenues, moreover (which are largely derived from the general road user and adjacent landowners), are ample to take care of full interest and redemption on its costs and to provide for its proper maintenance.

### Cook Highway (Cairns-Port Douglas-Mossman Section).

This road, which was commenced by unemployed labour during the era of the last Government, has been rapidly pushed ahead by contract from the Port Douglas end, and by day labour from the Cairns end. It is anticipated that the road will be sufficiently completed early in 1934 to allow through traffic, thus breaking the isolation from which the Mowbray area at Port Douglas and the Mossman and Daintree areas have been suffering.

Extensive planting of cocoanuts and other tropical trees has been carried on adjacent to the road. The highway at times contours the rough spurs leading down to the beaches from the "Heights of Victory" (so named by Captain Cook), and at others traverses close to the beaches, and has been declared by a leading road authority as likely to be one of the finest coastal highways of Australia. I have no doubt but that its construction will lead to the use of much undeveloped scrub land north of Mossman, and ultimately north of the Daintree River.

The construction of the Stratford Bridge over the Barron River, near Cairns, is well in hand, and will materially shorten the above route and at the same time assure access to much land at the Barron Delta.

### Carnarvon Highway (Injune-Rolleston Section).

This road is designed to open up stock route communication between the southern and central-west, as well as for general traffic and communication to station properties.

Close liaison has been established with the Land Administration Board as to its requirements, and surveys of a considerable proportion of the route have been completed. It is hoped to commence road works during the financial year 1933-34. This project is one of those recommended to the Government by the Bureau of Industry.

### Surat Highway (Surat-Glenmorgan Section).

The relief works inaugurated at the conclusion of railway construction to Glenmorgan have been steadily continued. Although 20 miles or so of the road are now trafficable in all weathers as the result of recent construction, much work in black soil areas still remains to be done before full use of the road is obtained. The road, even in its incomplete state, is of great value to the Surat district, giving, as it does, very direct access to the railhead at Glenmorgan on the shortest rail route to Brisbane.

### Leichhardt Highway.

Works are steadily proceeding, and the journey between Taroom and the rail-head at Wandoan may now be completed under two hours, even in wet weather, as against half a day (with the certainty of being bogged) a few years ago.

### South-Western Highway.

Work has gone ahead on this section during the year, and all-weather communication between Thallon and St. George is now almost an accomplished fact. Further west, isolated bad sections have received attention.

### Burnett-Condamine Highway.

It is proposed during the year 1933-34 to recommend the gazettal of a State highway between the Burnett and Condamine districts. A long length of road previously declared as a main road in the Shires of Wondai, Wambo, and Chinchilla will be consolidated into the State highway, which passes across the Dividing Range through a very large area of land which it will aid in intensive development. This area consists of the brigalow and belar scrubs in the Durong and Burraburri area, the subsidiary roads of which were cleared under the Commonwealth-State Unemployment Scheme previously described.

The road has been so located as to give the easiest access to the various towns and butter factories at the least expense and with the least amount of travel to settlers, but its future use will be of a much wider nature than to these settlements—possibly wider than that of the Kingaroy-Bell section of the Burnett-Darling Downs Highway—for it will establish ultimate communication between centres so wide apart as Chinchilla and Wondai.

Before the opening up of the impassable scrub barrier by roads in the Durong area and the building of Cockerill's Crossing bridge over the Boyne River which was completed over two years ago, the people of the Burnett and, say, the Chinchilla districts were almost as alien to one another as are the people of China and Japan. The distance by rail from Wondai to Chinchilla is 393 miles, and via the route of the proclaimed highway 102 miles.

### Ayr Shire—Ayr-Rita Island Road.

Amongst many important works on roads other than those previously referred to, mention may be made of the construction of a timber bridge, consisting of thirty-four 30-feet spans 16 feet wide, as a dual purpose road and tramway bridge over an anabranch of the Burdekin River. It had been hoped that the bridge might have been utilised for tramway purposes during the present sugar-cane crushing season, but the contractor had not progressed far enough to allow this. The construction of the bridge is being subsidised by the Kalamia Estates, with a view to the elimination of the almost annual renewal of the low-level tramway crossing of the anabranch.

### Heat Treatment of Soils.

The Irvine process and machine has been employed continuously since the completion of the Walloon road experiment upon a black soil section of the Lockyer-Darling Downs Highway, between Gatton and Grantham, under conditions which will approximate to its wider use in the Western areas.

Mr. Irvine has made considerable improvements in the machine and in its method of working. On this particular job the machine is under hire from the patentee, and the method of work is directed by the Commission's engineers. The speed of operation has been more than doubled without appreciable diminution in the efficiency of burning operations, and with only a small increase in the quantity of wood fuel consumed.

The results of the work are referred to in the report of the Chief Engineer. The Main Roads Commissioner of New South Wales has kept in close touch with all operations, and with your approval, negotiations are in progress jointly with him in relation to the acquisition of the right to use the patented processes and machines, and for the design of improved machines by the use of which it is hoped to reduce costs further and to improve the material resulting from the treatment. It is sufficient here to say that the results achieved to date have been more satisfactory than was anticipated, and it has already been established that the cost of production is such as to warrant the use of the process on Western plains where fuel is available at a reasonable price, but where metal or gravel is unobtainable except at prohibitive cost.

The improvements expected from machines to be designed which will embody the results gained by our experience may lead to a much wider application of the process.

At the existing rate of progress of 2,300 feet per week of 6-feet width, the cost of material does not exceed 12s. per cubic yard of burned material (loose). The material has in service on the highway proved to be an excellent base course upon black soil. By means of a second story burn on Western plain country the necessary thickness of material to withstand traffic without the use of any top course metal should easily be obtained.

### Maintenance of Roads.

It is to be again emphasised that the best and cheapest method to ensure the adequate maintenance of constructed sections of roads—whether gravel, metal, or bitumen surfaced—has been by the employment of the regular patrol system. In cases where this method has not been adopted the roads are not in nearly as satisfactory a condition as in districts where patrol men have been regularly working.

It is intended to make definite requests to all councils having a reasonable length of constructed road to put the system in operation in the near future. Compliance with the request will benefit the interests of the councils concerned, this Commission, and the travelling public generally.

### A Tribute to the Road Workers.

Mr. Kemp concludes his report with this fine tribute to his men:—In conclusion, I desire here to thank the whole staff, from the Chief Engineer downwards, for their extra efforts during the past year, during which many additional responsibilities have fallen to their lot. Owing to their unflagging efforts and to the efficiency and keenness of workmen, the quality of work has improved and costs have been further reduced.

Work of very high quality indeed has been produced in some instances by unemployed relief workers, as, for instance, in the construction of the masonry-arched bridge over Little Saltwater Gorge on the Mount Spec road, referred to elsewhere. Particularly fine, also, has been the work carried out by relief workers on the Darling Downs and in scrub and mountain areas such as Nerang, Palmerston, and Western districts.

PLATE 149.—CAIRNS-PORT DOUGLAS ROAD UNDER CONSTRUCTION.

PLATE 150.

PLATE 151.

These photographs illustrate the scenic appeal of the coastal highway now under construction between Cairns and Port Douglas. The completion of this road will definitely break the isolation suffered in the past by the Port Douglas, Mossman, and Daintree areas.

Plate 152.—Douglas Shire—Cook Highway.
A tropical scene on the Mossman-Daintree section of the Highway.

Plate 153.—Cardwell Shire—Tully River-North Bank Road.
The luxuriant tropical foliage abutting the road has been preserved in its virgin state. The road serves a sugar district and a seaside resort.

PLATE 154.—THURINGOWA SHIRE—MOUNT SPEC ROAD.
A masonry arch bridge built entirely by relief workers.

PLATE 155.—PINE SHIRE—NORTHERN HIGHWAY.

Showing the grading of the Mountain section between Dayboro' and Mount Mee (1,732 ft.). Note the developmental road breaking off to serve the northern end of the mountain.

Plate 156.—Tiaro Shire—Tiaro-Glenbar Road.

A low-level bridge over the Mary River to provide access for a dairying and agricultural district. Note the especially strong concrete piers for flood resistance.

Plate 157.—Degilbo Shire—Goomeri-Childers Road.

A view from the Ban Ban Range, showing the closely-settled Coalstoun Lakes farming area.

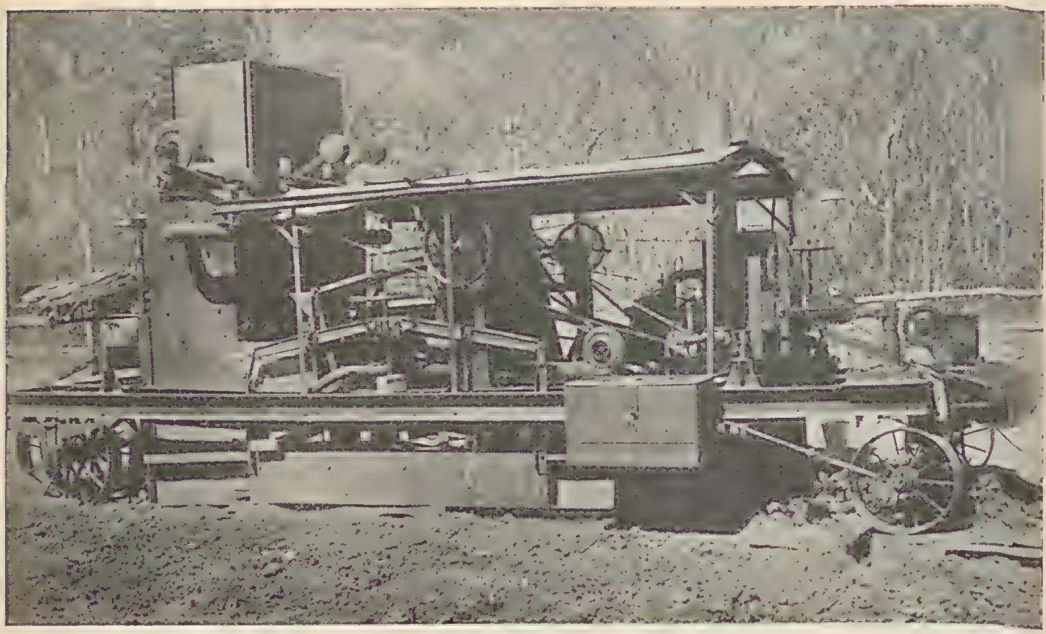

PLATE 158.—THE IRVINE TRAVELLING FURNACE IN OPERATION FOR THE "IN SITU" BAKING OF CLAY SOILS.

PLATE 159.—ROSEWOOD SHIRE—WALLOON-HAIGSLEA ROAD.
A section completed by the use of the Irvine Heat Treatment process.

PLATE 160.—TARAMPA SHIRE—LOCKYER-DARLING DOWNS HIGHWAY (BRISBANE-TOOWOOMBA SECTION).
A further section of road effectively treated by the heat process.

PLATE 161.—CABOOLTURE SHIRE—CABOOLTURE-BEACHMERE ROAD.
The old bridge over King John Creek.

PLATE 162.—CABOOLTURE SHIRE—CABOOLTURE-BEACHMERE ROAD.
The new bridge recently erected by the Main Roads Commission.

PLATE 163.—MONTO SHIRE—MONTO-THANGOOL ROAD.
A standard type of M.R.C. cattle grid near Coominglah.

Plate 164.—Rosewood Shire—Lockyer-Darling Downs Highway (Brisbane-Toowoomba Section).

Hospital Hill, Marburg—a section previously in very rough condition but now in good order through the use of relief labour.

Plate 165.—Taroom Shire—Leichhardt Highway (Taroom-Wandoan Section).

A typical section gravelled by contract to the benefit of a pastoral area.

PLATE 166.—CHARLEVILLE TOWN—CENTRAL HIGHWAY.

A reinforced concrete bridge over the Warrego River which provides access to the railway for a western pastoral area lying between Charleville and Adavale.

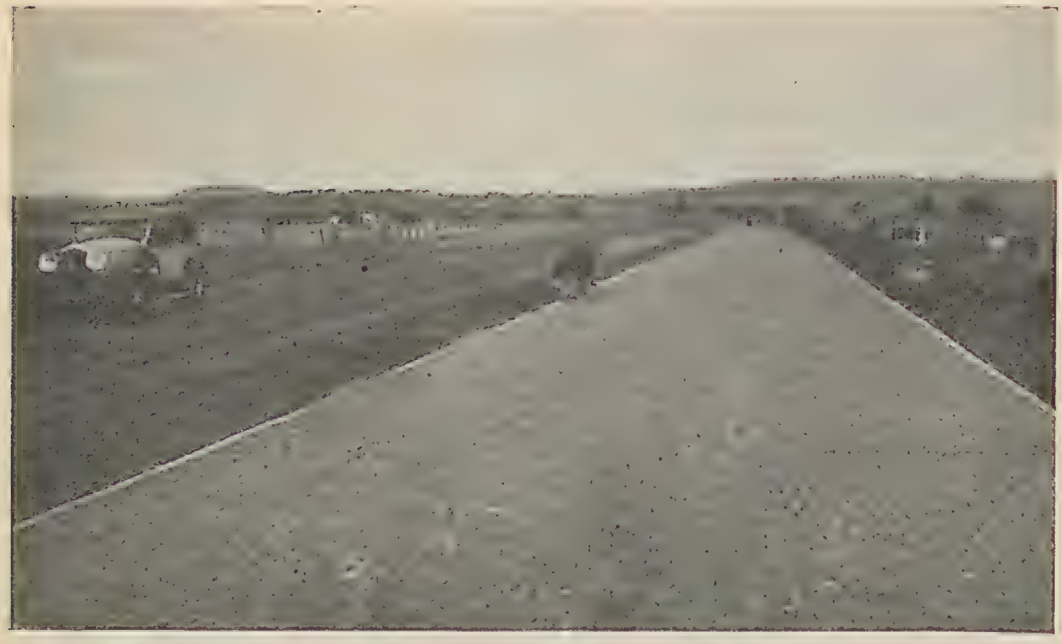

PLATE 167.—GLENGALLAN SHIRE—LOCKYER-DARLING DOWNS HIGHWAY (TOOWOOMBA-WARWICK SECTION.

A cement penetration job over heavy black soil in a farming area. Top course metal assembled ready for grouting.

Plate 168.—Glengallan Shire—Lockyer-Darling Downs Highway (Toowoomba-Warwick Section).

The slab completed (except for final trimming) and opened to traffic.

Plate 169.—Clifton Shire—Clifton-Hirstvale-Grantham Road.

Illustrating the deposition of silt after a heavy downpour of rain. The undamaged road is shown in the background.

PLATE 170.—EACHAM SHIRE—MILLAA MILLAA-INNISFAIL ROAD.

The McHugh Bridge over the Beatrice River, opened to traffic by the Minister for Public Works (Hon. H. A. Bruce) on 8th October, 1932. This bridge is the essential link between Millaa Millaa and the Palmerston area.

PLATE 171.—WATERFORD SHIRE—NEW ENGLAND HIGHWAY (BRISBANE-MOUNT LINDESAY SECTION).

A section between Brown's Plains and the McLean Bridge.

PLATE 172.—CLEVELAND SHIRE—CAPALABA ROAD.
A cement penetration section on a flat subject to flooding. The road serves a fruit-growing and tourist area.

PLATE 173.—MONTO SHIRE—MONTO-THANGOOL ROAD.
This road, which is being constructed in waterbound macadam, links up the Maryborough-Monto railhead with the Dawson Valley Line.

PLATE 174.—GYMPIE CITY—MAIN GYMPIE ROAD.

A scene reminiscent of military road construction in Flanders. During the third Battle of Ypres, in 1918, Australian Pioneer battalions made 10 miles of metal road and 18,300 yards of plank road in twenty-seven days—an outstanding feat in military engineering.

PLATE 175.—GYMPIE CITY—MAIN GYMPIE ROAD.

These two pictures show a cement penetration job in progress on a section subject to flooding at the entrance to Gympie.

## WORMS IN SHEEP.

FOR the purposes of these notes we may confine ourselves to three worms as being most prevalent where the parasite gives trouble in Queensland.

These are the Stomach Worm (*Hœmonchus contortus*), the Nodule Worm (*Oesophagostoma columbianum*), and the Tape Worm (*Tœnia expansa*). The presence of worms in a flock should be readily detected by the careful flockmaster. Usually there is a falling-off in condition for no apparent reason, a decided tail appears in the flock, and upon examination the membrane of the eye is noticed to be unduly pale, likewise the skin. Scouring may occur, and there is often a decided lump in the back of the affected sheep. There is a generally anæmic appearance, and in far-advanced cases a "bottle" appears under the jaw. Post-mortem examination will show the presence of stomach worms in the fourth stomach. Nodule worms will be detected by the presence of pimply-like lumps on the intestines varying in size from a pin's head to the size of a small pea. Tape worms inhabit the intestines, and grow in some cases to a great length, 12 feet being no uncommon.

In all three cases the remedy lies in systematic drenching.

The following drenches are recommended:—

(1) 2 oz. arsenic (98 per cent. pure), 4 oz. bluestone, 6 lb. Epsom salts, 5 gallons water.

*Doses.*—Grown sheep, 2 fluid oz.; 9 months to 15 months, 1½ fluid oz.; lambs (weaned), 1 fluid oz.

(2) 2 oz. arsenic (98 per cent. pure), 6 lb. Epsom salts, 5 gallons water.

*Doses.*—Grown sheep, 2 fluid oz.; 9 months to 15 months, 1½ fluid oz.; lambs (weaned), 1 fluid oz.

(3) 1 lb. fresh mustard, 1 lb. bluestone, 10 gallons water.

*Doses.*—Grown sheep, 4 fluid oz.; 9 months to 15 months, 3 fluid oz.; lambs (weaned), 2 fluid oz.

(4) Carbon tetrachloride, 2 c.c.'s; paraffin oil, 3 c.c.'s—for grown sheep.

To prepare No. 1 drench, boil the arsenic and Epsom salts in about 3 gallons of water, constantly stirring. Dissolve the bluestone in some of the water, and add when all ingredients are thoroughly dissolved. Make quantity up to 5 gallons.

No. 2 drench is prepared in the same manner, and is, in fact, the same except for the absence of bluestone.

No. 3 (Mustard and Bluestone).—Mix the mustard in sufficient water to make a thick paste, adding more water from time to time. Dissolve the bluestone separately and mix the two together, making the whole up to 10 gallons. Properly-graded drenching vessels should be used in the administration of drenches.

The head of the sheep should not be raised further than necessary, and the animal should stand squarely on all four feet.

When using carbon tetrachloride and paraffin oil, a specially constructed syringe is recommended, the object being to get the drench right at the back of the throat. In the cases of drenches 1, 2, and 3, sheep should be yarded and starved for at least twelve hours previous to drenching, and should be kept away from water for four or five hours after drenching.

When carbon tetrachloride is used no starvation is necessary.

Where the infestation is a bad one, two drenches within ten days are advocated.

### TO SUBSCRIBERS—IMPORTANT.

**Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.**

**It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.**

## THE POINTS OF A GOOD HORSE.

*A writer in the "Live Stock Journal" (London) makes the following observations, which should be of especial interest to Queensland horsemen:—*

THE horse is, above all things, an animal with a purpose in life. Some very willingly, conscientiously, or, perhaps, spiritedly, are prepared to perform their duty. Others object, and some there are that refuse. His ability to perform his work will depend upon three things:—

(1) Form.—His whole body, legs, angles, and feet must be so constructed as to enable him properly to perform the duties required of him.

(2) Construction.—His heart, lungs, digestion, and circulation must be such as to ensure endurance and stamina.

(3) Temperament.—His breeding usually will determine his intelligence, courage, disposition—in short, all that goes to make up the character of an anmial that any horse lover would wish to own.

### What a Judge must know.

A judge, then, must be familiar with all the curves, angles, muscles, joints of a horse's anatomy, in order that he may be in a position to understand or to estimate how certain conformations will stand up under strain and wear under test.

He must, further, know, by continuous handling, whether the hoofs are of the best texture and shape; whether the pasterns and shoulders are properly sloped; whether the points are well formed and free from unsoundness; whether the general type of the horse is such as to ensure service ability. Again, he must be familiar with faults of the eye, of the wind, of the digestion, of the circulation, so that he knows at once, or by careful test, how the animal is likely to measure up under different conditions of work and feed.

Still further, he must be able to read a horse's character; to determine his disposition; to decide whether he has the heart and intelligence to continue proven and dependable under difficult or trying circumstances.

### Does he Fill the Eye?

How, then, are we to judge a horse? In the first place, take him as he stands. How does he measure up under first inspection? Does he fill the eye? Does his whole form satisfy your judgment as to what it should be? We expect to find a clean-cut head, full nostrils, firm lips, depth and width at the angle of the jaw, full clear eye, broad forehead, erect ear.

There must be no thickness at the junction of the neck with the head. The neck should be reasonably arched, of fair length, and filling full into the shoulder.

Constitution is indicated by depth and fullness in the chest. The shoulder should be long and sloping, and blend perfectly into the body. The rib should be well sprung, closely knit, and carry well down, giving the appearance of depth and compactness of form. The back should be short and well muscled, while the loin should be short, broad, and look closely coupled.

The croup should be long, muscular, and straight, and the thighs deep, full, and plump, with muscle extending well down towards the hock. The quarters, viewed from behind, should carry such a mass of firm, hard muscle as to give the appearance of a strong and compact ham or hindquarter.

### The First Look.

The first general view of the horse should be such as to fix the impression as to his form and to enable the judge to accurately determine his constitution, temperament, and character. The form, no matter what may be his class, should indicate compactness, strength of muscling, together with symmetry of outline.

The horse's disposition will be determined by the apparance of the eye, carriage of the head, fullness of the forehead; in the energy or activity in every movement of the body and the alertness of his position even when standing at ease.

The supreme test of a horse, however, lies in an examination of his feet, legs, and action. The closest, most critical inspection must be given to these features in arriving at a judgment as to a horse's value. Now view him from in front. The forelegs should be straight and set well under the horse. This will indicate compactness of conformation, and provide for control in action. Viewed from behind, the muscling of the quarters will be observed, and the set of the hindlegs must be noted. Dropping a plumb-line from the point of the buttock, it should be found to divide equally the hock, cannon, pastern, and foot. Careful study will indicate the proportion that should be sought between the length of quarter and of cannon bone, the slope of pastern, and the conformation of the foot.

### What Legs and Feet Mean.

The legs and feet should now be minutely examined. The arm should be compact and muscular, and the forearm relatively long from the elbow to the knee, thus providing free and easy action. It should be noted that the forearm is free at the elbow, and its muscular development may be taken to indicate the general strength of the horse.

Breadth in the knee is desirable, and its outline should be clearly defined and prominent. Depth from the front to back is expected, and there must be no tendency towards calf knee or knee sprung. The cannon should be wide, short, and full below the knee in order to give the latter proper support.

The combination of sinew and bone in the cannon should present a flat, hard, clean, well-defined appearance, thus indicating quality and proper texture throughout. In breeds with feathering the hair should be fine, soft, and silky. The pasterns will be found usually of a similar angle to that of the shoulder, and straight pasterns are therefore very undesirable. They should be sloping, strong, and of proportionate length. The texture of the feet must be carefully observed.

The hoof head should be full, rounded and free from defect; the heels of good depth; the frog prominent; and the sole of the hoof concave. This is one of the most sensitive and most intricate mechanisms of the body, and its size, shape, and texture must therefore be carefully considered.

In examining the hind legs, conformation of the hocks should be particularly noted. They are frequently seats of disease or injury, and poor conformation in this region cannot be forgiven. The outline should be clearly defined, the point prominent, and there must be no gumminess or meatiness whatever. The cannons should be wide, short, and clean, and found to properly support the hock. Reasonable slope in the hind pasterns is desirable, and they should be strong and of proportionate length. The hind feet must be examined as to size, texture, and conformation in the same way as the foreleg.

### Movement Tells Much.

The horse in action should be observed at the walk and trot. This is the final test, and is one of the most important. Sluggishness and indifference in movement seriously detract from the value of the animal. Firm, erect, alert carriage, coupled with strong, steady, free movement, present a combination that carry their own recommendation.

At a walk a horse should pick up his feet cleanly and firmly, and put them down again as though always under control. He should move straight away, the legs being carried straight under him and reasonably close together. The action of the muscles in flexing the foot should be carefully noted. Deflection to the right or to the left at the toe, knee, or hock denotes lack of control or improper balance, seriously interfering with the levelness of action.

At the trot the same regular, controlled movement should be observable. Clean, straight going is in keeping with proper conformation in the legs and feet. Careful study of action suggests the spirit, temper, disposition, utility, and endurance of a horse, and is never to be dissociated from its relationship to structure and conformation.

# PASTURE IMPROVEMENT AND DAIRY PRODUCTION.

*Subjoined is a report of an address by Mr. P. Waller, manager of the Berry Experiment Farm, at a recent Illawarra district conference, under the auspices of the Agricultural Bureau of New South Wales. Mr. Waller discussed pasture improvement from two aspects, namely—(1) Its general influence on animal health; and (2) the possibilities of producing high-grade fodder for dairy stock.*

FOR over one hundred years, Mr. Waller said, heavy grazing and soil erosion had been depleting the coastal grazing lands of their fertility, while no attempt had been made to put back what was being removed. It was little wonder that these lands were becoming less productive each year, that the growth came later each spring, and the cattle were becoming unthrifty and disappointing in both appearance and production. Dr. Woodman, of Cambridge University, had shown that a cow giving about 300 lb. of butter-fat per annum required for her needs: Nitrogen, equal to 450 lb. sulphate of ammonia; phosphoric acid, equal to 150 lb. of superphosphate; potash, equal to 130 lb. of 20 per cent. potash salts; and calcium, equal to 130 lb. of carbonate of lime. It was only natural that the enormous drain on the soil fertility would make its presence felt; and to-day the clovers and high fertility demanding grasses like rye became starved out of even the best pastures, with the result that the carrying capacity of the land was decreasing fast, the cattle often manifested depraved appetites by chewing bones, sticks, &c., while in other cases there occurred "strange diseases" such as various kinds of lameness, stiff or enlarged joints, sprains, enlarged spongy bone, and in extreme cases, even broken limbs. These were all evidences of mineral deficiency.

### The Value of Minerals in the Ration.

Discussing the purpose of minerals Mr. Waller said that three, viz., phosphorus, potash, and calcium were removed from the soil in large quantities in milk and other animal products. As they existed in the soil in comparatively small proportion and could not be absorbed from the air, and they were essential to enable the animal to build up a healthy body, it naturally followed that they had to be artificially supplied. Minerals were important in enabling the soil to produce and utilise abundant supplies of humus, a valuable soil constitutent for successful cropping or pasture improvement. Fortunately, at least two important components of any pasture, or fodder, viz., the carbohydrates and the protein could be obtained largely from the atmosphere; by the growing of legumes and by efficient cultural methods it was possible greatly to increase the amount of protein in the pasture.

It was fortunate that most of our pasture land contained sufficient potash for present needs, but there was a singular shortage of phosphorus and calcium in most dairying districts.

Phosphates were the most important mineral ingredient of the body, and they were supplied only by the food used. Hence it was essential that the food should be rich in phosphates. The use of lime for livestock was increasing daily because its importance had never been so clearly demonstrated as at present. Some land had enough lime for the growth of crops, but there was not any where an application of lime would not benefit the animals grazed thereon. Even soils rich in lime rapidly became depleted of it when under constant cultivation or grazing; it was often found that ground limestone gave a good response on land containing limestone grave or pebbles. At Berry Experiment Farm, soil samples taken prior to laying down the pastures four years ago revealed that choice alluvial loam was deficient to the extent of 2 tons of lime per acre, while the poorer clay soil required up to 10 tons of lime to make up for its calcium deficiency.

Lime not only supplied the calcium needs of the plant, but by neutralising acidity created favourable conditions for the growth and activity of soil bacteria which fixed atmospheric nitrogen. It also prevented the reversion or waste of superphosphate in the soil, liberated potash, and improved the soil texture which largely governed its water-holding capacity.

The animal body made desperate efforts to keep the calcium supply of the blood up to normal, and where there was not enough in the food, the bone structure was drawn upon, hence the reason for weak bones. It had been proved that, no matter how well a cow was fed before calving, she was unable to assimilate enough lime for her bodily needs and heavy milk production. Hence a cow could not milk profitably for long, unless she had a big reserve of calcium. Any deficiency in lime in the fodder was quickly reflected in the health of the animal. Where phosphates and lime were deficient, the animals developed the habit of chewing bones, and this rendered them liable to poisoning by "botulism," a toxic

principle secreted by the *bacillus botulinus.* Experience had shown that in such cases best results were obtained by the application of properly balanced fertilizers to the pastures, since the minerals were first metabolised by the plants, and then used by the animals in the best form for assimilation.

## Sowing Pasture Grasses.

Mr. Waller then discussed methods of establishing and managing sown pastures, the following being extracts from this portion of his paper:—

When we adopt the practice of topdressing it is of prime importance that we have the best grasses available in order to get the best results from the fertilizers applied; thus we cannot get good results from paspalum in winter time, no matter how well it may be topdressed. Therefore, we plant winter-growing types like prairie, cocksfoot, rye grass, Subterranean clover, &c., which will furnish plenty of well-balanced pasture during cold weather and until the paspalum comes along to supply the herd during summer. Thus by proper management we can have two crops growing in the same soil and without the labour of ploughing for them, for this is what pasture management represents to the farmer who gives proper attention to his grazing land.

Pastures may be sown down after careful preparation of the land as for any other crop, or the seed may be broadcasted and harrowed after a vigorous renovation of the paspalum sod; the former method, though expensive, will give winter feed in three months' time, while it takes about twelve months for the plants to become established when sown after renovation only. In either case, the fertilizers are applied prior to sowing the seed and where possible shortly after rain, so they may be rapidly absorbed in order to obviate the risk of windy weather causing the lighter particles to rise and blow away.

If Subterranean clover is sown early in autumn, and fertilizers applied, it will produce good feed during winter, and at the same time it will be found to enrich the soil quite appreciably and encourage the growth of high fertility grasses like rye, to the detriment of useless weeds like Parramatta grass.

The establishment of young pastures will be assisted by applying 1 cwt. of sulphate of ammonia per acre; this will ensure a valuable growth of winter pasture, having a feed value closely approaching that of concentrates such as bran or crushed linseed, which it largely displaces during winter feeding.

Management of pastures comprises the entire treatment necessary to maintain the pastures in a maximum state of efficiency throughout the year. Briefly, it includes the subdivision into small paddocks to permit rotational grazing of the young grass, followed by the removal of all stock and the harrowing of the paddocks to thoroughly spread the animal droppings so that they are again rapidly incorporated into the soil as fertility for the supply of subsequent grazing.

If the droppings are not harrowed regularly after each grazing they produce patches of rank growth of grass which are left by stock throughout the entire season. This condition increases with each successive grazing and results in the loss of a large portion of valuable grazing area; it frequently happens that much of this manure-covered land, if not harrowed, may not be available for years unless the droppings are ploughed in or removed in some way. After careful observation it has been calculated that the year's manure from thirty cows contain fertility equal to that found in the following commercial fertilizers:—9 tons of sulphate of ammonia, 2½ tons of superphosphate, 4½ tons of sulphate of potash. At present prices, these would be worth approximately £200 per year to the farmer, and would represent a very real contribution towards his farm's upkeep, whereas, if allowed to remain undisturbed, the manure limits the capacity of his pasture; thus the value of using grass harrows becomes very apparent.

## Cost of Treatment.

The annual cost for fertilizers which, in our experiment gave the most economical result, viz., ½ ton of lime every three years, 2 cwt. superphosphate per year, 2 cwt. sulphate of ammonia yearly, was as follows:—Lime (at 32s. per ton), say, 6s.; superphosphate (at £5 per ton), 10s.; sulphate of ammonia (at £12 per ton), £1 4s.; total, £2 per acre yearly.

**Production per Annum at Berry.**

Treated and managed paddocks produced 219 lb. fat at 10d. per lb. = £9 2s. 6d. per acre yearly; untreated but managed paddocks produced 118 lb. of fat per acre at 10d. per lb. = £4 18s. 4d.; untreated and unmanaged paddocks produced 25 lb. per acre at 10d. per lb.= £1 0s. 10d. per acre. Thus, we found a profit of £7 2s. 6d. per acre yearly above cost of fertilizers, or, viewed another way, it represents to us the striking fact that by using fertilizers we made a return of £2 4s. 2d. per acre more than was earned by the untreated areas for the year. In addition to this we had the satisfaction of knowing that our treated land was still better at the end of the season than the untreated, and that the cattle were better for having grazed on the former.

Further evidence of the value of pasture improvement is indicated by the past season's production; this is of special interest, since it includes many heifers which are the progeny of the first animals reared on our treated land and show a notable improvement in both appearance and production.

Average production for the year ended 30th June, 1927: 7,562 lb. milk testing 3.6 per cent. = 272 lb. fat per annum for each cow; while the average production for year ended 30th June, 1933: 8,910 lb. milk testing 4.22 per cent. = 376 lb. fat per annum for each cow.

## THE IDEAL SHADE FOR PIGS.

The type of protection from the heat of the summer sun recommended by the Waikato Pig Recording Club (New Zealand) is here illustrated. It is made on the fence line with three posts in either field and a few pieces of timber, taken from post to post, to carry bundles of ti-tree. The air circulates through the ti-tree, making for a very cool condition in the shelter. The photograph was taken on the farm of Mr. J. D. Browning at Orini.

It should be unnecessary to emphasise the value to pigs of shade in the summer, especially for pigs rapidly reaching a marketing weight. The pig has no fur or much hair to protect it while it has no sweat glands. Thus it feels the effect of the heat more perhaps than any other animal. This is why it loves to

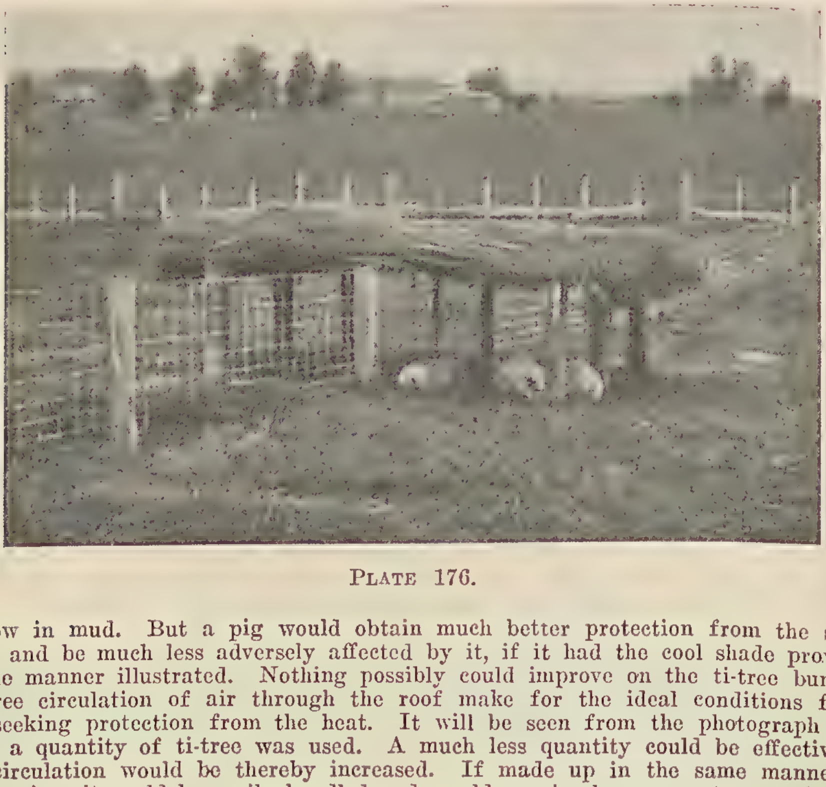

PLATE 176.

wallow in mud. But a pig would obtain much better protection from the sun's heat, and be much less adversely affected by it, if it had the cool shade provided in the manner illustrated. Nothing possibly could improve on the ti-tree bundles, as free circulation of air through the roof make for the ideal conditions for a pig seeking protection from the heat. It will be seen from the photograph that quite a quantity of ti-tree was used. A much less quantity could be effective as the circulation would be thereby increased. If made up in the same manner as for fascines it could be easily handled and would require less support, necessitating only the use of four posts.—"The New Zealand Farmer."

# A TALK TO JUNIOR CLUB MEMBERS.

PRIMARY production constitutes the basic industry of this State. The dairy section alone involves 24,000 individual farms, with, approximately, 100,000 people domiciled thereon. The product of their activities is, in round figures, of an annual value of £7,000,000 On this industry depends wholly or partly other enterprises of manufacturing, transportation, trade finance, and commerce.

To give adequate service to the industry its problems must be viewed in their proper perspective and solved by procedure based on experience and knowledge, gained by the application of practical methods.

The problems of the primary producer are many and complex, embracing principles of agriculture, livestock breeding, feeding, and management, also the marketing of the products. No institution, educational or regulatory, can prescribe cut-and-dried remedial measures in the solution of the difficulties that arise. The present instability of international trade, commerce, and finance has affected agriculture to an extent greater than ever before, and it has been found necessary to make adjustments to meet the difficult marketing conditions. World-wide economic conditions cannot be changed through the administration of local bodies controlling dairy activities.

The various boards associated with primary industry cannot find markets where they do not exist. Agricultural and dairying enterprises, as in other branches of industry, must make essential adjustments, eliminate waste, and standardise their output, and thereby secure a full measure of industrial efficiency, while awaiting essential economic readjustment within the Commonwealth and a stabilisation of the world's market for primary products.

Such readjustment lies beyond the scope of the primary industries concerned. The legality of the marketing charter instituted under the provisions of the Primary Producers' Organisation and Marketing Act has been challenged, and the various activities that have developed under the provisions of that charter are being examined more critically than ever before.

In determining what are essential activities, it is only proper to consider carefully education and research along with other phases of the industry. Any review must be made with a constructive purpose.

To determine the wisdom of and to measure accurately the value of the application of modern methods to agriculture and dairying is not an easy matter, owing chiefly to the general disorganisation of trade and commerce throughout the world.

The dairying industry in Queensland has kept in step with dairy research, increased production, and improved quality, but it has been found that such a betterment has not increased returns to the dairy farmer. In order to determine definitely the value of dairy research it is essential to analyse the incidence of its application to the various phases of the industry. The extension of the industry, improvement of quality, and increase of output cannot be interpreted in terms of additional return to dairy farmers as a body, although from the viewpoint of the individual it may represent a distinct gain.

The progressive dairy farmer who obtains a high yield from the individual animals that constitute his herd, and who delivers a high grade product, is, other things being equal, in a better position than one who obtains lower yields from his herd, and who delivers a product below first grade.

Improved technique in dairy practices which brings about an actual saving in the cost of production widens the gap between costs and prices. An example of the saving that is possible by herd improvement is shown in the tabulated records of animals in three dairy herds, and which are included in these notes.

As individual members of a junior club you may reason that there is not much that you can do to improve world's prices for dairy products, and so put the dairying industry on a more advantageous footing and bring the industry a fuller measure of prosperity. Members should realise, however, that they can accomplish something on a small scale. You can, for example, induce dairymen to stop criticising unfairly the activities of fellow dairymen, and organise in furthering the interests of primary producers, realising that the solution of your problems will be found in close and sincere co-operation. Organisation is the price of progress and prosperity, and without it farmers cannot hope to receive a fair reward for their labours.

Through co-operation much can be done to put farm problems before primary producers in their true perspective and point the way to their solution. Industry without education and training in the control of its various activities is doomed to failure, for security and progress are dependent on intelligent application of knowledge and the use of the right technical methods and principles of sound husbandry.

The results of research pertaining to the industry, to be of most value, must be made available to farmers generally, many of whom have never had the advantage of any special training.

Through your Junior Association, by lectures and short courses of instruction and discussions at group meetings, it is hoped to bring constantly before your members information of practical value designed to help the industry in which you are engaged, and so help to solve your difficulties satisfactorily. As a division of the Local Producers' Association the Junior Section should set out to achieve the object of bringing new discoveries, the results of experimentation and research, and their application to the industry, to fellow dairy farmers throughout the State, while, at the same time, taking the fullest advantage of them themselves.

### Why High Producing Cows are Most Profitable.

The profitability of high producing cows is shown clearly in the cases cited below.

Which is the best herd?—

22 cows, each producing 200 lb. fat, returning £250 over feed cost;
or

12 cows, each producing 300 lb. fat, returning £250 over feed cost;
or

9 cows, each producing 400 lb. fat, returning £250 over feed cost.

Answer.—9 cows, each producing 400 lb. fat yearly.

Why?

Each herd returns £250 over feed cost.

But—

1. The 22-cow herd produced 800 lb. fat (22 per cent.) more than either of the other herds, which tends to build a surplus and depress prices.
2. The 22-cow herd required 38 per cent. more feed than the 12-cow herd and 58 per cent. more than the 9-cow herd.
3. The 22-cow herd required more time and labour and greater expenses in shelter and taxes than either of the other herds.
4. The 12-cow herd produced butter-fat at a feed cost 24 per cent. lower than the 22-cow herd.
5. The 9-cow herd produced butter-fat at a feed cost of 32 per cent. lower than the 22-cow herd.

## CARE OF MILK AND CREAM IN SUMMER.

Generally speaking, greater care in the handling of milk and cream becomes necessary during the summer months. Many dairymen are loth to realise that milk and cream are very delicate substances, that they readily absorb taints and odours, and that their flavour and keeping qualities are easily spoilt.

Scrupulous care must be taken, therefore, to prevent their pollution, not merely by dust, dirt, and flies, and by the minute portions of the stale milk or curd which adhere to vessels unless they are regularly and thoroughly rinsed, scalded, and scoured bright, but also by the smells and taints given off from dung heaps, dirty bails and yards, neglected skim-milk receptacles, and sour milk, rubbish and filth. These should not be allowed to accumulate or remain near places where cows are milked, nor where milk or cream is stored. Furthermore, workers must not be allowed to smoke whilst engaged in the milking shed or milk room, as the smoke taints the milk.

## AGRICULTURE ON THE AIR.

**Radio Lectures on Rural Subjects.**

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by Officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 2nd January, 1934, a fifteen minutes' talk, commencing at 7 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for January, February, and March, 1934:—

SCHEDULE OF LECTURES
BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK.
RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 2nd January, 1934—"Farm Training." F. O. Bosworth, M.A., Principal, St. Lucia Training Farm.

Thursday, 4th January, 1934—"Banana Thrips." Robert Veitch, B.Sc., F.E.S., Chief Entomologist.

Tuesday, 9th January, 1934—"Building up a Rural Civilisation." J. F. F. Reid, Editor of Publications.

Thursday, 11th January, 1934—"Ticks." F. H. Roberts, M.Sc., Entomologist.

Tuesday, 16th January, 1934—"Observations and Cultural Practices of the Citrus Industry in Queensland," Part I. H. Barnes, Acting Director of Fruit Culture.

Thursday, 18th January, 1934—"Observations and Cultural Practices of the Citrus Industry in Queensland," Part II. H. Barnes, Acting Director of Fruit Culture.

Tuesday, 23rd January, 1934—"Tomato Diseases." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Thursday, 25th January, 1934—"Garden Pests." J. A. Weddell, Assistant Entomologist.

Tuesday, 30th January, 1934—"Vanishing Assets—Soil and Grass." J. F. F. Reid, Editor of Publications.

Thursday, 1st February, 1934—"Maize Varieties and their Suitability to Certain Districts." C. J. McKeon, Instructor in Agriculture.

Tuesday, 6th February, 1934—"Pasture—Requirements and Composition." E. H. Gurney, Agricultural Chemist.

Thursday, 8th February, 1934—"Chemistry in Agriculture." E. H. Gurney, Agricultural Chemist.

Tuesday, 13th February, 1934—"Products of the Bee Hive." Henry Hacker, Entomologist.

Thursday, 15th February, 1934—"The Plough and the Cow." J. F. F. Reid, Editor of Publications.

Tuesday, 20th February, 1934—"Citrus Diseases." L. F. Mandelson, B.Sc. (Agr.), Assistant Plant Pathologist.

Thursday, 22nd February, 1934—"Harvesting Cotton." R. W. Peters, Experimentalist.

Tuesday, 27th February, 1934—"The Value of the Fruit Industry in Queensland." H. Barnes, Acting Director of Fruit Culture.

Thursday, 1st March, 1934—"Tobacco Soils of Queensland." W. Cartmill, B.Sc., Analyst.

Tuesday, 6th March, 1934—"Papaw Diseases." J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 8th March, 1934—"Seasonal Farm Crops." A. E. Gibson, Director of Agriculture.

Tuesday, 13th March, 1934—"Cotton Growing on New Cultivations." R. W. Peters, Experimentalist.

Thursday, 15th March, 1934—"The Colour of Butter and Cheese." O. St. J. Kent, B.Sc., Analyst.

Tuesday, 20th March, 1934—"Pineapple Diseases." H. K. Lewcock, M.Sc., Assistant Plant Pathologist.

Thursday, 22nd March, 1934—"Local Producers' Associations—Their Influence on Agricultural Progress." J. F. F. Reid, Editor of Publications.

Tuesday, 27th March, 1934—"Strawberry Culture." H. Barnes, Acting Director of Fruit Culture.

Thursday, 29th March, 1934—"The Internal Parasites of Sheep." F. H. Roberts, M.Sc., Entomologist.

## PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Ayrshire Cattle Society, the Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled for the month of October, 1933 (273 days period unless otherwise stated).

| Name of Cow. | Owner. | Milk Production. | Butter Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| | AUSTRALIAN ILLAWARRA SHORTHORNS. | | | |
| | MATURE COW (OVER 5 YEARS), STANDARD 350 LB. | | | |
| Daisy 3rd of Oakvilla | H. Marquardt, Wondai | 11,005·26 | 415·122 | British Admiral |
| May 2nd of Oakvilla | H. Marquardt, Wondai | 10,589·4 | 387·699 | Victory of Greyleigh |
| | SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB. | | | |
| Scarlet of Trevor Hill | George Gwynne, Umbiram | 10,770·8 | 422·251 | Prince of Braemar |
| | JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB. | | | |
| Rosenthal Maggie 11th | S. Mitchel, Rosenthal | 8,229 | 335·549 | Sunrise 3rd of Rosenthal |
| | SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB. | | | |
| Thornleigh Pet 8th | C. O'Sullivan, Greenmount | 8,142 | 314·081 | Cosey Camp Alma's Beau |
| | JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB. | | | |
| Navillus Amy | C. O'Sullivan, Greenmount | 8,101·75 | 309·085 | Charmer of Glenleigh |
| | SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB. | | | |
| Dahlia of Trevor Hill | A. E. Vohland, Aubigny | 7,574·8 | 287·521 | Prince of Braemar |
| Wandegong Empress | G. D. Lindenmayer, Binjour | 6,385 | 262·99 | Emperor of Spurfield |
| | JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB. | | | |
| Trevor Hill Starlight | G. Gwynne, Pittsworth | 9,179·55 | 376·897 | Gambol of Wilga Vale |
| Sunnyview Ida | R. Tweed, Kandanga | 8,578·15 | 373·508 | Lovely's Commodore of Burradale |
| Kingsdale Dulcie 12th | A. A. King, Mooloolah | 7,899·1 | 329·808 | Empress of Burradale |
| College Flash | Queensland Agricultural High School and College, Gatton | 7,180·94 | 293·441 | Premier of Hillview |
| Honey 6th of Kingsdale | A. A. King, Mooloolah | 6,878·15 | 276·94 | Empress of Burradale |
| Princess 9th of Kingsdale | A. A. King, Mooloolah | 6,384·45 | 243·453 | Empress of Burradale |

## JERSEY.

| | | | | |
|---|---|---|---|---|
| **Junior, 4 Years Old (under 4½ Years), Standard 310 Lb.** | | | | |
| orna of Oakview | F. J. Cox, Imbil | 7,607·7 | 381·717 | Acacia Crusader |
| Glenmah Victor's Maidenhair | F. A. Maher, Indooroopilly | 6,305·82 | 327·433 | Retford Victor's Noble |
| **Junior, 3 Years Old (under 3½ Years), Standard 270 Lb.** | | | | |
| Glenmah Victor's Bracken | F. A. Maher, Indooroopilly | 5,571·3 | 299·222 | Retford Victor's Noble |
| **Senior, 2 Years Old (over 2½ Years), Standard 250 Lb.** | | | | |
| Greenstock Buttercup | J. B. Keys, Gowrie Little Plains | 6,781·4 | 391·453 | Carnation's Lark's Baron |
| **Junior, 2 Years Old (under 2½ Years), Standard 230 Lb.** | | | | |
| Faith of Peeramon | A. H. Koppen, Peeramon | 7,369·45 | 372·748 | Roseboy of Richmond |
| Glenview Lady May | F. P. Fowler and Sons, Coalstoun Lakes | 5,362·6 | 327·94 | Glenview Alfriston Duke |
| Bee of Inverlaw | R. J. Crawford, Kingaroy | 6,203·95 | 325·619 | Bruce of Inverlaw |
| Golden Rose of Golden Hill | C. Klaus, Mundubbera | 5,055·25 | 303·36 | Hero of Golden Hill |
| College Goldspray 2nd | Queensland Agricultural High School and College, Gatton | 5,294·12 | 279·883 | Burnside Renown |
| Glenview Primrose | F. P. Fowler and Sons, Coalstoun Lakes | 4,365·75 | 273·198 | Carlyle Larkspur 2nd Empire |
| Wyreene Rose Marie | J. B. Keys, Gowrie Little Plains | 4,900·38 | 270·301 | Lyndhurst Victor |
| Tot of Golden Hill | C. Klaus, Mundubbera | 4,434·5 | 263·649 | Pride's Hero of Burnleigh |
| Oxford Mabel II. | E. Burton and Sons, Wanora | 4,036·91 | 251·409 | Trinity Ambassador |

## AYRSHIRE.

| | | | | |
|---|---|---|---|---|
| **Mature Cow (over 5 Years), Standard 350 Lb.** | | | | |
| Longlands Babette | Thos. Holmes, Yarranlea | 9,405·15 | 372·011 | Prince Roy of Fairview |

## FRIESIAN.

| | | | | |
|---|---|---|---|---|
| **Junior, 3 Years Old (under 3½ Years), Standard 270 Lb.** | | | | |
| St. Athan's Gypsy 11th | W. H. Grams, Upper Tent Hill | 8,372·54 | 323·234 | General Dutch Oak |

## GUERNSEY.

| | | | | |
|---|---|---|---|---|
| **Junior, 2 Years Old (under 2½ Years), Standard 230 Lb.** | | | | |
| Linwood Clarice | A. S. Cooke, Witta | 5,541 | 262·3 | Moongi Bright Boy |

# Answers to Correspondents.

## BOTANY.

*Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.*

**Honey Locust.**

P.B. (Harlin)—

The specimen is *Gleditschia triacanthos*, the Honey Locust, a native of North America, but cultivated in many warm temperate countries. It is planted in Australia a good deal, and trees may often be seen on the Darling Downs. It belongs to the family Leguminosæ. The flowers are supposed to be very valuable honey producers, and the pods are eaten by stock. In the case of this tree some pods have probably been eaten and the seeds voided. The tree is deciduous and is easily grown from seed.

**Mackie's Pest.**

C.J.J. (Noumea, New Caledonia)—

The grass is *Chrysopogon aciculatus*, very common in North Queensland and looked on as rather a serious pest. It is commonly known as Grass Seed or Mackie's Pest. The seeds work through clothing and cause irritating sores. We have seen this grass as far south as Brisbane, but fortunately it does not seem to succeed in the southern parts of the State.

**Guinea Grass.**

G.W. (Mackay)—

The specimen is *Panicum maximum*, Guinea Grass, fairly common in Queensland, and indeed widely spread over most tropical and sub-tropical countries. It makes very good "chop-chop" for horses and other stock. Though it produces a large seed head, the percentage of infertile seed is usually fairly large. When once introduced in a locality, however, it seems to establish itself readily enough.

**Flax (Climbing Buckwheat, *Linum*.)**

F.E.J. (Pittsworth)—

The specimen with the blue flower is *Linum usitatissimum*, the ordinary flax or linseed. This is probably the cause of your trouble. The ordinary flax contains a prussic acid yielding glucoside which would probably affect sheep in the way you describe. The other plant like a convolvulus in habit is not one of the Convolvulus family, but is *Polygonum Convolvulus*, the Climbing Buckwheat, not known to be poisonous or harmful in any way. The black, triangular seeds which you received among the canary seed would belong to this plant. Your specimens of *Linum* have been passed on to the Agricultural Chemist for testing for a cyanophoric glucoside.

***Calotropis Gigantea.***

T.M. (Mareeba)—

The specimen is *Calotropis gigantea*, a native of India and Southern China. The bark contains a very strong fibre. So far as we know the sap has no value as a rubber, but the plant has reputed medicinal value among the Indians and Chinese. The plant is quite ornamental but might become a weed, and would probably be poisonous to stock as it belongs to a dangerous family, the Asclepiadaceæ. It is naturalised in some parts of the Gulf country, and we should think that once established would readily spread.

**Milky Cotton Bush.**

T.M. (Marmor)—

The specimens represent *Asclepias curassavica*, variously known as Milky Cotton Bush, Red Head, Wallflower Cotton Bush, Wild Oleander, &c. It is a native of the West Indies and tropical America, but is now a naturalised weed in most warm countries. It is poisonous to stock though, generally speaking, they do not eat it in sufficient quantities to cause trouble.

**Shepherd's Purse.**

O.J.S. (Thulimbah)—

The specimen is *Capsella Bursa-pastoris,* the Shepherd's Purse, a common European plant now naturalised as a weed in most warm temperate countries. It is very common in Queensland. A case has been recorded in New South Wales where young horses feeding on a cultivation paddock badly infested with this weed showed signs of colic, became bloated, and died. It was then found that they contained balls of fibrous material to the extent of nearly 50 per cent. of fibres from Shepherd's Purse, and death was due to simple mechanical obstruction of the bowel. No cases of trouble having been caused by the plant have come under our notice in Queensland, although this is a fairly common weed here.

**Bird's Foot Trefoil ("Blackberry").**

A.T.P. (Clermont)—

1. *Lotus australis,* Bird's Foot Trefoil. This plant belongs to the family Leguminosæ, and is a valuable fodder. It contains a prussic acid yielding glucoside, however, and if eaten in any great quantity, especially by hungry stock, death may ensue.
2. *Solanum nigrum,* called Blackberry in Queensland, but, of course, does not belong to the Blackberry family. It is sometimes called Deadly Nightshade. The ripe seeds are freely eaten by children, apparently without any ill-effects, but the green berries, we should say, would be decidedly poisonous. The plant belongs to a dangerous family, the Solanaceæ, which contains many poisonous plants.

**Molasses Grass.**

C.H. (Proston)—

The grass is not *Panicum muticum,* but *Melinis minutiflora,* Molasses Grass, a tropical grass now grown to some extent in Queensland, particularly in the more tropical parts of the State, such as the Daintree River. This grass has some reputation abroad, but our experience with it so far in Queensland has been that stock will not take to it unless driven to it by extreme hunger. Then they will eat it readily enough. When other food is available, however, they absolutely reject it. On the whole the grass is not one we could recommend for your district. The grass sets seed, but the seed is very light and small. *Panicum muticum* is a much better fodder, but it is very frost tender, and on the whole likes a rather moist climate. Kikuyu is another grass of similar habit, and is probably the best of the three for you to plant, although we think this should only be planted on an experimental scale.

**Oxalis.**

J.L. (Brisbane)—

We have had no experience with the use of sulphate of ammonia on oxalis, though we are inclined to believe it would simply blacken off the foliage and the bulbs would eventually recover. In South Australia, where an allied species of Oxalis is a very serious farm pest, it has been found that sodium chlorate sprayed on in solution—one pound of sodium chlorate to one gallon of water—has been effective. The weedicide, ''Weedex,'' containing calcium chlorate, should be obtainable from most florists. In ordinary forking out, of course, care should be taken to see that the central bulb is obtained, and this should be removed as carefully as possible, especial care being taken to see that the little bulbils, all around the base of the leaves and at the top of the main bulb, do not fall off. Individual bulbs could perhaps be destroyed by applying to them, with the aid of an ordinary oil can, a few drops of crude carbolic acid. A few drops on a bulk, or a little sprinkle on a tuft, should entirely kill it. Ordinary kerosene might also be effective, though we have had no experience with it in oxalis eradication. These methods seem rather laborious, but there is no easy method of eradication.

**Dog Weed.**

F.McC. (Mundubbera)—

The specimen is *Verbesina encelioides,* the Dog Weed, a native of North America, now a common naturalised weed in New South Wales and Queensland. Dr. Seddon, of the Glenfield Veterinary Research Station, New South Wales, informed us recently in conversation that he had found this plant to be definitely poisonous to stock, though cases of poisoning by it are very rare. So far as we know the plant has not been declared a noxious weed for your shire.

**Fumitory.**

J.S.V. (Millmerran)—

The specimen is the Fumitory, *Fumaria officinalis.* The common Fumitory is a European weed, now naturalised in most warm temperate countries. It is generally regarded as poisonous to stock, but we have no very definite information regarding it. So far as we have observed stock seem to leave the plant untouched. It is a winter and a spring weed, and dies off at the approach of hot weather. Its eradication should not be a very difficult matter.

**Tall Oat Grass.**

T.H. (Ascot)—

The specimen is *Themeda avenacea,* the Tall Oat Grass. It may only be regarded as a second-rate pasture growth, though it produces a fair quantity of leafy growth, and both leaves and stems are generally regarded as nutritious. It is more adapted, we think, for cattle and large stock than for sheep. We should hardly think it worth while sowing for grazing purposes. The grass is also found in New South Wales. In a good growing summer season, particularly in Northern Queensland, it attains a great height, up to 7 or 8 feet. It has been grown experimentally under cultivation in New South Wales, and although it succeeded well it was apparently not thought sufficient of to proceed with.

**Pepper Grass.**

J.M.W. (Beaudesert Line)—

Your specimen is *Lepidium ruderale,* commonly known as Pepper Cress. It is one of the worst weeds we have for tainting milk, but apart from this it is quite a good fodder. It is one of those weeds commonly known in Queensland as Turnip Weed or Mustard Weed, names, however, applied in a very general way to members of the family Cruciferæ.

**Prickly Poppy.**

F.R.D. (Cloncurry)—

The specimen is *Argemone mexicana,* the Prickly Poppy, a very obnoxious weed which should be eradicated before it obtains a footing in a district. In Queensland, we think it is most abundant on the coast and on the Darling Downs. It is suspected of being poisonous to stock, but is rarely eaten by them. The only cases that have come under our notice have been where the plant has been cut, allowed to wilt, and the subsequent softened plant eaten by calves.

**Khaki Grass.**

J.H.A. (Southbrook)—

Some years ago experiments were carried out by Mr. F. B. Smith, then Assistant Agricultural Chemist, at Beaudesert, and he found that the khaki weed was easily destroyed by common salt, that is, butcher's salt or any waste salt, at the rate of one or two tons per acre. A weak arsenic solution was also found to be effective, but, of course, this spray is dangerous to use where stock are running. If you did not care to use an arsenical spray you could use a spray like "Weedex," which contains Calcium Chlorate. Though stock often graze without ill-effects in paddocks where weeds have been sprayed with this substance, care, of course, should be taken to see that stock are not allowed to get at tins containing the concentrate, or unused spray.

## CROWN LAND FOR GRAZING SELECTION.

### Marathon Resumption.

*By courtesy of the Minister for Lands, Hon. Percy Pease, we are able to make the following announcements regarding grazing lands open for selection:—*

Approval has been given for the opening for grazing homestead selection of the subdivisions of Marathon Resumption in the Hughenden district.

Five portions, ranging from 24,000 to 27,000 acres, will be opened at the Land Office, Richmond, on Thursday, 11th January, for a term of lease of twenty-eight years, at rentals ranging from 2d. to 2½d. per acre. The portions are situated from 13 to 18 miles south of Barabon Siding, and comprise good sound sheep country but not suitable for lambing purposes.

The portions comprise undulating downs, pebbly in places, and well grassed in normal seasons, with shade along the watercourses.

The blocks are well improved with bores and equipment, fencing, yards, and huts. The improvements on the blocks range from £1,000 to £2,300.

The selections will require to be stocked to a reasonable carrying capacity with the applicants' own sheep within a period of three years, and proof must be furnished of the financial standing and pastoral or land experience of the applicants.

Free lithographs and full particulars of these lands may be obtained from the Land Agents, Richmond and Hughenden; the Land Settlement Inquiry Office, Brisbane; and the Government Intelligence and Tourist Bureau, Sydney.

### The Canmaroo Lands.

Approval has been obtained for the opening of a block of 22,000 acres in the parish of Canmaroo for prickly-pear development grazing homestead selection.

The block is suitable for both cattle and sheep, and will be available at the Land Office, Roma, on the 9th January next, for a term of lease of twenty-eight years, at an annual rental of ½d. per acre for the first fourteen years of the lease. The selection will be subject to the ringbarking of 8,000 acres and the provision of two permanent water improvements during the first eight years of the term.

A block of 62 square miles, known as Ungabilla block, will also be opened for pastoral development lease for a term of thirty years, at a rental of 15s. per square mile for the first twenty years of the lease.

The lessee will be required to ringbark 10,000 acres of the holding and provide three permanent water improvements during the first ten years, and to enclose the holding with a good and substantial fence during the first three years.

These blocks are situated about 15 miles south-westerly from Glenmorgan Railway Station.

Free lithographs and full particulars may be obtained from the Land Settlement Inquiry Office, Brisbane; the Land Agents, Roma, St. George, and Dalby; and the Government Intelligence and Tourist Bureau, Sydney.

# General Notes.

## Staff Changes and Appointments.

Mr. W. H. Yeo, of Victoria Point, and C. Heinemann, of Redland Bay, have been appointed Honorary Rangers under the Animals and Birds Acts.

Mr. W. J. McCurley, of Mount Glorious, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Messrs. F. Burow (Woongoolba, via Yatala), E. H. R. Fabian (Mount Cotton), M. E. Krebs (Woongoolba, via Yatala), and S. R. Black (Pimpama) have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Messrs. K. R. Hack (Nerang) and J. Wilson (Hunchy) have been appointed Growers' Representatives on the Banana Industry Protection Board until the 30th September, 1934.

Mr. C. H. Defries has been appointed an Inspector under the Dairy, Stock, and Slaughtering Acts, Department of Agriculture and Stock.

Mr. D. A. Williams, Beaudesert, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

## Amended Definition of Peanut-Grower.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts amending the definition of a "peanut-grower."

The Order in Council constituting the Peanut Board provides that the persons entitled to vote at elections are those who have produced peanuts for sale within a given time. The amended definition provides that a grower shall be any person who during the twelve months immediately preceding any election or referendum has cultivated and grown peanuts for sale in any part of the State on not less than half an acre of land of which he is the owner or tenant, or who at the time of the election or referendum has growing not less than half an acre of peanuts for sale on land of which he is the owner or tenant.

## Animals and Birds Sanctuary at Round Hill.

An Order in Council has been issued under the Animals and Birds Acts declaring the Reserve for Recreation and Captain Cook Memorial at Round Hill, near Miriam Vale, to be a sanctuary under and for the purposes of the abovementioned Acts.

It will now be unlawful for any person to take or kill any animal or bird on this sanctuary.

## Broom Millet Board.

The election of two growers' representatives on the Broom Millet Board resulted as follows:—

| | Votes. |
|---|---|
| Hans Niemeyer (Hatton Vale, Laidley) .. .. .. | 50 |
| Erich Max Schneider (Binjour Plateau, Gayndah) .. | 44 |
| Ernest Fred Hutley (Gurgeena, via Gayndah) .. .. | 33 |
| Thomas Martin Rasmussen (The Caves) .. .. .. | 23 |

Messrs. Niemeyer and Schneider were the retiring members, and will now be reappointed for a further term of one year as from the 1st November.

## Spraying of Deciduous Fruit Trees.

A new regulation under the Diseases in Plants Acts has received approval. It provides that every owner or occupier of an orchard in the Stanthorpe Fruit District shall cause his fruit trees to be sprayed once during the months of July or August every year to the satisfaction of an inspector, with one of the following approved insecticidal sprays:—

*Miscible Oils.*—One gallon of oil to 20 gallons of water.

*Lime-Sulphur.*—One and a-half gallons of a lime-sulphur concentrate registered under "*The Pest Destroyers Act of* 1923" to 10 gallons of water, and/or 1 gallon of 33 degrees Baume Lime-Sulphur Concentrate to 10 gallons of water.

*Tar Distillate.*—In the case of stone fruits, 1 gallon of tar distillate to 33 gallons of water. In the case of pip fruits, 1 gallon of tar distillate to 25 gallons of water.

**Apple Levy.**

A regulation has been issued under the Fruit Marketing Organisation Acts which rescinds the existing Apple Levy Regulations, and empowers the Committee of Direction of Fruit Marketing to make a levy on all fruitgrowers in the Stanthorpe area—that part within a radius of 40 miles from Wallangarra in which are situated the railway stations of Wallangarra to Dalveen, both inclusive, and Amiens to Fleurbaix, both inclusive.

The amount of the levy shall be 1d. per bushel case of apples grown and marketed from this district. When any apples are railed from any station in the district, the levy shall be computed at 3s. 4d. per ton (40 bushel cases or 80 half-bushel cases) and a proportionate part of 3s. 4d. for each fraction of a ton. Where more than one grower contributes apples to any consignment, the total amount of levy in respect thereof shall be paid by such growers in proportion to the respective weights of their contributions. A minimum of 1d. shall apply for any one consignment.

Every fruitgrower shall pay direct to the Committee of Direction the levy due by him before the fifteenth day of each month in respect of apples marketed during the preceding month. The provision is made, however, that fruitgrowers railing apples to any other destination than the Committee of Direction shall, at the time of railing, pay the levy to the Commissioner for Railways. Agents holding money to the credit of the fruitgrowers shall, if so required by the Committee of Direction, pay the levy to such Committee.

Every company or person carrying apples in such district for any market other than for railing from any station in the district, shall, on or before the fifth day of each month, furnish a return to the C.O.D. of all consignments carried during the preceding month.

The amounts received from the levy shall be used, firstly, for incidental costs, and secondly, the balance shall form part of the Apple Stabilisation Fund for the benefit of the Stanthorpe growers.

**Better Boar Subsidy Scheme.**

The better boar subsidy scheme now in operation offers exceptional opportunities for the farmer interested in the improvement of his pigs and in the development of a more extensive pork export market.

Following is a list of the centres to which better boars have been sent under the scheme up to the end of November, 1933:—

*Western.*—Dalby, Ipswich, Komine, Walloon, Square Top, Surat, Warwick, Gold Creek, Rosevale.

*Northern.*—Innisfail, Bambaroo, Ingham, Malanda.

*South Burnett.*—Tingoora, Murgon, Wondai, Cinnibar, Goomeri, Nanango.

*Upper Burnett.*—Abercorn, Mundubbera, Barajondo, Gayndah, Cannindah, Riverleigh, Biloela, Littlemore, Thangool.

*North Coast.*—Bauple, Eewah Vale, Widgee, Palmwoods, Maleny, Imbil, Mapleton, Kilcoy, Samsonvale, North Arm, Eumundi, Gunalda, Rockhampton, Garden Island, Gympie, North Maleny.

*South Coast.*—Rathdowney, Ormeau, Currumbin Creek, Springbrook, West Burleigh, Beenleigh, Gleneagle, Maroon.

As this is essentially an export trade scheme, subsidies are payable only on boars in those breeds specially recommended for the overseas trade—viz., Large Whites and Middle Whites. Boars over six months old only are eligible for subsidy.

Boars purchased under this scheme are subject to a 20 per cent. rebate in freight when transported over Queensland railways.

Sows of any age or breed are not eligible for subsidy or rail rebate.

The scheme permits of the farmer selecting the pig himself and then completing and submitting his application for subsidy, or requesting the Department to select and deliver the boar. In the latter alternative, applicants must ascertain the cost and pay in advance, the Department undertaking to estimate the total purchase price and make all arrangements for purchase and delivery as required.

When the applicant selects the boar himself, it is essential that he arrange with the District Stock or Dairy Inspector to inspect and complete a health declaration. These papers must also be certified to by a justice of the peace. When the Department purchases the stock, the officer attending to the purchase arranges all necessary papers in the presence of the vendor.

There are no unnecessary conditions, nor does the Department expect the farmer to incur a heavy outlay in the purchase of expensive animals.

The average price paid to date for selected animals is on a par with prices charged by stud pig breeders for breeds not included under this scheme, and no evidence is forthcoming of any excessive prices being charged or paid.

Each application is dealt with on its merits, and if applicants exercise care in preparing and submitting their papers, there should be no unnecessary delay in completing purchases. The decision to limit subsidy to boars in the two breeds mentioned—six months old or over—is in the interests of purchasers, and should entail no undue hardship on vendors.

The farmer must be prepared to accept the buying officer's purchases without claiming any refund, and must relieve the officer of responsibility, on the understanding that every care will be taken to ensure satisfaction to all concerned.

When stock are purchased in other States certain additional formalities are necessary, but these can be arranged. Transport expenses in these cases is much higher than in the case of Queensland purchases, and will be estimated by the officer purchasing stock.

All applications must be submitted on proper forms obtainable at the Department of Agriculture and Stock, Brisbane. All communications should be addressed to the Under Secretary.

### Post Christmas Gifts and Greetings Early.

Our readers are reminded of the desirability of posting Christmas gifts and greetings early in order to assist the Postal Department and obviate possible disappointment to the public. During the twelve working days preceding last Christmas Day the Mail Branch at the Brisbane G.P.O. was called upon to handle 3,500,000 letters, 1,250,000 packets and newspapers, 42,000 registered articles, and 107,000 parcels, comprising the contents of 32,600 bags of mail.

The handling of such large numbers of articles naturally imposes a severe strain upon the resources of the department. Hence the exhortation to shop early, pack securely, address plainly, and post early. Packets may be marked, "Do not open until Christmas."

### Christmas and New Year Greeting Telegrams.

The Post Office telegraph service has again made arrangements, from 19th December, 1933, to 7th January, 1934, for seasonal greeting telegrams during the forthcoming Christmas and New Year season to be issued to the addressee on a specially designed and coloured form, which will be enclosed in an attractive envelope.

No extra charge will be made by the department for this facility—the usual nominal rates will apply. All that is necessary for those who propose utilising the service is simply to write the greeting messages on the usual forms and lodge them at any telegraph office. Write the word "Greeting" at the top of each form. The messages can also be lodged by means of the phonogram service.

The greeting telegram should commend itself to the business man, as seasonal greetings by telegraph to customers build good will; they are sure to please, because telegrams are always warmly personal and reach the person for whom they are intended.

Each year the greeting telegram is becoming more popular, as is apparent from the increasing number lodged with the department each succeeding Christmas season, and special arrangements have been made by the Telegraph Department to dispose of a larger volume of this class of business rapidly and accurately during the forthcoming festive season.

The Telegraph Service will send telegrams to anyone, at any place and at any time. It makes no difference whether the telegram is to go one mile or 5,000 miles; clients will always receive the same unfailing courtesy, efficiency, and promptness in the treatment.

Specially reduced rates will also be in operation on cablegrams, radiograms, and beam wireless messages, lodged for transmission to other parts of the world. The rates may be obtained at any post office.

# Rural Topics.

## The Genetics of Jacob.

The reference made in the Legislative Assembly recently by the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) to the genetics of Jacob would indicate that while genetics has only recently been regarded as a distinct branch of science, the foundations on which it rests are very old—in fact prehistorical. Human records, as far back as they go, provide evidence of a very early recognition of the principles of heredity, on which certain systems of selection in animal breeding were founded. To go no further back than the days of Jacob, we find that he devised a definite system of animal breeding and selection, by which he was able to beat even his wily old father-in-law. No doubt Jacob was in advance of his time, and he kept the secret of his success, so far as his contemporaries were concerned, to himself, for like many a modern cattle duffer who uses less scientific methods for acquiring stock he was purely selfish. In fact, his whole life was governed by the well-known formula: "Hang you, Jack, I'm all right!" If you had lived alongside of him you would certainly have watched your flocks by night, and would have taken no chances with newly dropped calves or unmarked lambs. He was what Australians call a "shrewd head," otherwise a consummate rogue; but that is no reason why we should do him an injustice on the score of his knowledge of stock and herd management.

The book of Genesis, which was quoted by Mr. Bulcock in reply to a question in Parliament, sets out in detail Jacob's system of influencing colour transmission in stock. The particular reference is Genesis xxx., 27-42, and that passage of Scripture is often cited to prove that Jacob believed in the efficacy of maternal impressions. A careful reading of the chapter shows that he realised the importance of segregation, as he put three days' journey between his own spotted and brindled mob and the flocks of Laban. The account of his methods has been given to us by one who was certainly an unbiassed observer, and who was not concerned with the material aspect. To get a clear understanding of Jacob's ideas on breeding, it is necessary to read the following chapter of Genesis—Genesis xxxi., 8-14—which purports to be Jacob's own account of the way he worked to windward of the old man. Here it is:—

> "If he (Laban) said thus: The speckled shall be thy wages, then all the cattle bare speckled; and if he said thus: The ring-straked shall be thy hire, then bare all the cattle ring-straked. Thus God hath taken away the cattle of your father and given them to me, and it came to pass at the time that the cattle conceived that I lifted up mine eyes, and saw in a dream, and behold the rams which leaped upon the cattle were ring-straked and speckled and grizzled. And the angel of God spoke to me in a dream saying, 'Jacob,' and I answered, 'Here am I.' And he said, 'Lift up now thine eyes and see, all the rams which leap upon the cattle are ring-straked, speckled, and grizzled, for I have seen all that Laban doth unto thee.' "

Jacob had been well "stung" in his first contract with Laban. He had worked like a bullock in pole or pin for fourteen long years to make good his slip from grace, and had been struggling all that time to provide for his family. As a result of deep thinking while tailing his herds his "inspiration" came in a dream—Mixed breeding and isolation. Many a scientific man has found the solution of a difficult problem in the same way.

Taking the two chapters of Genesis together, Jacob had observed apparently the results of cross-breeding, and probably also observed what happened when both parents were of the same type. A genetic analysis of Laban's cattle is, of course, impossible, but if "ring-straked, speckled, and grizzled" are assumed to be dominant characters, it must be recognised that Jacob's breeding methods were not based altogether on superstition. He realised the value of isolation, and had some knowledge of the importance of giving the get an opportunity to develop under the most favourable conditions. Since the modern breeder makes use of the same principles, it indicates that the art of breeding was fairly well advanced at that early period.

## The Pig's Nose—An Index of Health.

The nose of a pig is an index of his or her nature and condition. In the healthy pig the nose is moist, cool, and pink in colour. To the touch it is elastic. In disease it changes in appearance, becoming pallid or purplish, dry, hot, and rigid, or else flabby. Many an experienced breeder can tell at a glance the general condition of a pig from the condition of his nose. When pigs grow listless and seem to be dozing or sleeping more than usual, inspect their noses, and you are likely to find in them the indications of trouble.

**The Feeding of Dairy Cows.**

The following extracts are from a paper read by Mr. G. F. Shirley at the Illawarra District Conference, Agricultural Bureau of New South Wales:—

In the past we were content to convince ourselves that this food or that was good for producing milk, beef, or energy, and very rarely stopped to reason why. In much the same way we condemned certain rations as being "entirely unsatisfactory," or described certain tracts of country as being "no good for rearing cattle." In the feeding of cattle we have an almost unlimited number of facts which leave room for scientific investigation, and our present knowledge of feeding has been obtained from the accumulation of results disclosed by a great number of experiments.

The bodies of all animals are composed of sixteen main substances in varying proportions. These are as follows:—Water (oxygen and hydrogen), lime, iron, iodine, chlorine, manganese, potassium, phosphorus, sulphur, silicon, flurine, magnesium, carbon, sodium, as well as a few very small but important traces of copper, nickel, &c. There is now a special branch of sicence that has for its study the many ills—deficiency diseases they are called—that go hand in hand with the lack of one or more of these essentials.

It is important to note that most of the essential minerals can be present in nature in two forms, viz., organic and inorganic (that is to say, not organic), and it is the job of the vegetable kingdom to convert them from the inorganic form, which cannot be assimilated, into the organic form which can be readily digested. The great value of supplying minerals to your cattle in this way is the fact that the vegetable kingdom always supplies adequate quantities of digestives and vitamins for proper mineral assimilation. In a recent edition of that American paper, "Hoards Dairyman," a list was published showing the varied capacity of certain well-known crops to utilise certain mineral matter from the soils, the basis for comparison being an estimate of the average amount taken by each sort of crop from 1 acre of ground. The assimilation of lime for the growth of the several varieties was as follows:—

Oats, 102 lb. per acre.
Maize, 100 per acre.
Barley, 106 lb. per acre.
Lucerne, 405 lb. per acre.
Peas, 386 lb. per acre.

You will appreciate from the above the relative capacity of each of these plants to supply, among other things, that one essential—lime. Incidentally, the table gives us some idea of the amount of that particular substance that is required as a minimum for growth. As it is an established fact that, within certain limits, a cow never gives milk that is imperfect in its recipe, you will realise how important an abundant supply of all necessary essentials, in easily digestible form, can be.

In the marrow of her bones and in the fats of her body nature has provided the cow with a remarkable storehouse wherein she is able to stock away, in times when the right food is available, a concentrated supply of food and mineral matter upon which she can draw when times are lean, to convert into blood to nourish the tissues of her body, supply materials for the growth of her unborn calf, and later on supply it with milk. Although she can do this, it is evident that a cow that has to draw upon her reserves in this way for any length of time will be well below par and quite unable to do her best. Should this natural storehouse eventually run out and her foodstuffs still continue to lack any of the necessary essentials, she will invariably develop depraved tastes in an attempt to supply the want. If this deficiency should still continue, she will very soon dry herself right off. This trouble is rendered all the more serious in cases where the animal is young and there are the double requirements of growth and milk production to be supplied. We have all met the man who will tell us about some wonderful heifer that he had that "did remarkably well on her first or second calf but never did any good afterwards. He never seems to blame himself or the food for it.

November can be such a critical month for cows, not only because of the change of climate that it brings with it, but also because in this month we see the end to the spring urge to production. The cow is thrown back upon her own resources, or, rather, what resources she has left after robbing her bodily reserves to supply the extra spring production. That is why poorly fed cows drop in production so suddenly with the first really hot summer day.

Even with the most carefully thought out ration the mineral losses, particularly of lime and phosphorus, that are sustained by a heavy milking cow when at the peak of her production, are a serious problem, and one is rather inclined to believe that the milking capacity of our high-producing cows has been so increased by selective breeding that it considerably exceeds their capacity for mineral assimilation which, by the way, should be a still further argument for the adequate feeding of cows during the dry period in order to enable them to make good the losses that may have occurred. There are still, unfortunately, men who consider that the worst paddock on the place is "good enough for dry cows."

About twenty-seven years ago the theory of a balanced ration was hailed as a complete basis for scientific feeding, but when the wide differences of results obtainable from a variety of theoretically balanced rations were noted, it becam apparent that the idea of balancing a ration did not go far enough, and the closer study of mineral structure of foodstuffs became necessary. Still closer study and experiment directed attention to the fact that the mere presence of all the mineral essentials in a food did not always crown the mixture with success. Theoretically perfect combinations were evolved, upon which, however, animals languished and died unless some milk or some green matter was added. It was the study of this "mysterious something" that permitted the assimilation of essentials, that first evolved the idea of vitamins.

Since the first discovery of the presence of vitamins we have learnt that there are many different kinds—each with a particular function of its own to aid in the assimilation of different kinds of substances. Thus we have a vitamin that aids the absorption of lime by the body; another that aids the absorption of fats, and so on. The most recent vitamin that has been discovered is one that has a very marked effect upon fertility and its application has had the effect of rendering many hitherto sterile animals fertile.

A cow that is on good Australian pasture will consume 110 to 120 lb. of grass per day, which would supply to her body about 23 lb. of dry matter and about 8 gallons of water. Provided the pasture contains a reasonable amount of mineral matter a cow fed on these pastures is being fed with enough material to make between 2 to 2½ gallons of milk per day according to the thriftiness of the animal. You will realise that upon ordinary good pasture of this kind, a cow that is giving over, say, 2 to 2½ gallons per day requires an extra amount of milk-making material to prevent her robbing her system. As she cannot eat any more grass, it stands to reason that if our breeders cannot supply us with a cow with a much larger stomach, then we must supply portion of her food in a more concentrated form.

In making up combinations of concentrates and roughages it is as well to remember there are, unfortunately, very few foods that alone are able to supply a full range of all necessary essentials, and therefore the most satisfactory rations must, of necessity, include in their make-up a fair variety of foods from different plants. Care should be taken to avoid choosing roughages and concentrates that are derived from "the one stalk," as, for instance, wheaten chaff and bran, corn silage and ground maize meal, green oats and ground oatmeal, &c., &c. The same idea can be extended to cover the undesirability of combining two substances that are deficient in the same essential such as, for instance, maize meal and bran, both of which are lacking in lime.

The same principles apply in the growing of crops and explain the remarkably superior results obtained from feeding a crop of oats that has been mixed with a certain percentage of legumes such as peas, vetches, tares, &c., in order to make up for the deficiencies in the composition of the oats, or say a crop of green maize that has been mixed with either soy beans or lucerne to correct the same defect.

From the foregoing you will appreciate the fact that the farmer who carefully studies the food combinations for his stock both in regard to minerals, vitamins, and concentrates will have a herd that, as well as being resistant to the usual inroads of stock diseases and troubles, will be able to produce milk to maximum capacity, economically, and of the highest quality that hereditary capability will allow.

### Brine for Curing Pork or Beef.

One gallon water, 1½ lb. salt, ½ lb. brown sugar, ½ oz. potash. *Method.*—Boil and skim, then cool, when cold pour over the meat. The meat must be thoroughly cold and well sprinkled with crushed saltpetre to remove the surface blood. The above proportion to be used in making any quantity. Float a raw potato or an egg to test the strength of the brine.

**Economical Poultry Feeding.**

On present indications, writes the Poultry Expert of the New South Wales Department of Agriculture, it is apparent that poultry farmers are faced with one of the biggest crises ever experienced in the industry, as the average price of eggs is already lower this year than last, and prices are likely to remain lower during the remainder of the flush season, while it does not appear that there will be any substantial reduction in the cost of the main feeding stuffs. It is essential, therefore, that those dependent upon the industry for a living should do everything possible to effect economies without causing any reduction in egg production.

Those new to the industry may be tempted to reduce the food supply as soon as production commences to decline, but such a course would soon bring about a worse state of affairs, as the birds must have as much food as they require, and any attempt to cut down the ration would prove disastrous. In cases, however, where costly rations are being fed a reduction in cost of feeding may be effected by gradually changing over to a simple balanced ration such as is fed to the Hawkesbury Agricultural College egg-laying competition birds and those on the Department's poultry farms. This ration is as follows:—

*Morning Mash.*

| | Lb. |
|---|---|
| Pollard | 60 |
| Bran | 34 |
| Meat meal | 6 |
| | 100 |
| Salt | 22 oz. |

*Evening Feed.*

| | Lb. |
|---|---|
| Wheat | 66 |
| Cracked maize | 34 |
| | 100 |

With regard to the evening feed, the proportion of maize can be reduced owing to its higher cost than wheat, and where sufficient green feed is not available lucerne chaff meal or dust could take the place of up to 15 per cent. of the bran without affecting the "balance" of the ration.

Should the price of wheat fall any lower wheat meal could probably be obtained or gristed on the farm at a cheaper rate than pollard or bran, in which case wheat meal could form up to 50 per cent. of the morning mash as follows:—

| | Lb. |
|---|---|
| Wheat meal | 50 |
| Pollard | 20 |
| Bran | 23 |
| Meat meal | 7 |
| | 100 |
| Salt | 22 oz. |

Another means of reducing the cost of the morning mash would be to use rice pollard in place of wheat meal, the other ingredients being the same as in the above mash. The difficulty, of course, is that the supply of rice pollard would not be adequate to meet a heavy demand, and for this reason it would be perhaps preferable to use partly rice pollard and partly wheat meal in conjunction with bran and pollard as follows:—

| | Lb. |
|---|---|
| Rice pollard | 24 |
| Wheat meal | 24 |
| Wheaten pollard | 24 |
| Bran | 21 |
| Meat meal | 7 |
| | 100 |
| Salt | 22 oz. |

Where an abundance of green feed such as lucerne or other crops which can be finely chaffed is available, 20 to 25 per cent. by weight could be used in place of that quantity of bran, but additional green feed may also be given later in the day. Any change decided upon should be made gradually, otherwise production may suffer.

### Making White Hide.

1. Soak the hide in clean water for four hours, then run off the dirty water and cover with clean water; leave for twenty-four hours. This should be sufficient for fresh or salted hides. Dry hides should be soaked for a further twenty-four hours, or until they are soft.

2. Remove the hair by soaking hides in milk of lime—30 lb. lime per 100 gallons water. Handle each day, and leave until the hair can be removed—about six to seven days in summer.

3. Remove all flesh and fat by scraping with a knife. Wash well with several lots of water during the twenty-four hours after removing the hair and pieces of flesh, fat, &c.

4. Tan in a solution of alum (5 lb.), salt (1½ lb.), Glauber salt (1½ lb.), and water (10 gallons). Use enough of the solution to cover the hides. Handle twice daily and allow six days for tanning.

5. Drain well from the alum and salt solution, but do not wash; then cover both sides with fish oil or neatsfoot oil, and hang up and allow to dry slowly. Tanners have a machine for forcing the oil fats, &c., into the hide.

6. When dry, stretch until soft. If dry skins are difficult to stretch, sprinkle with water and cover for two days; again stretch and dry.

Alum-tanned leather is sometimes covered with a paste instead of oil before drying. The paste is made up as follows:—5 lb. flour, 2½ lb. alum, 1 lb. neatsfoot oil, 1 to 1½ gallons water.

Mix the alum and salt with water and then the flour and oil in a separate basin. Add to the flour and oil sufficient of the alum and salt solution to make a paste. Put the hide and paste into a tub, and handle the hide vigorously so as to force the paste into the leather. Hang the leather up and allow it to dry slowly without removing the paste. If the leather is too firm, rub on more fat, such as soft dripping, &c. If possible, stretch the leather just before it is quite dry. After stretching, it can be nailed on a wall or similar surface.—From directions issued by the Lecturer-in-Charge, Tanning School, Sydney Technical College.

### Maize for the Dairy Farmer.

Though lucerne was usually termed the "king of fodders," said Mr. H. O. Cox, of Kangaroo Valley, in introducing his address on maize-growing at an Illawarra district farmers' conference, he was of the opinion that, for the dairy farmer, maize was really the crop which should be given that title. As a grain, it was unsurpassed as a concentrate that could be produced on the farm and stored till wanted, while if it was not required it could be sold and the money used to buy any other feed required. While lucerne could not be grown on some farms, every dairyman could grow maize.

To make a success of maize-growing the farmer must be an opportunist and carry out the cultural operations at the times best suited for them. Correct fallowing and tilling of the soil were half the battle. The deeper the ploughing, up to, say, 8 inches, the better, and it should be done early, say, at the end of May or in June, to retain the winter rains and expose the soil to the sweetening effects of the winter.

Wind and dry weather in spring would cause clodding, and to prevent this it was necessary to cultivate. Mr. Cox's practice was to apply 1 cwt. each of superphosphate and blood and bone in early August, and to disc harrow twice to cover the broadcasted fertilizer. A further disc harrowing was given in September to destroy weeds and then usually a light rolling. It has been found more economical to use the harrow than to plough a second time.

Seed selection work should be commenced in the paddock and attention given to type, disease freedom, yield, and maturity. Late maturing varieties were sown in rows 3 feet 4 inches apart with three seeds every 27 to 30 inches, a machine being used. Cultivation, consisting of the use of a springtooth cultivator and also a scuffler, ceased when the crop reached a height of 3 feet, since then the roots formed a network close to the surface and were damaged by the implements.

In conclusion, Mr. Cox emphasised the great value of the work being done in the Southern States by means of maize-growing competitions. Farmers were prone to overlook the national value of these competitions, though they realised their worth to the growers.

### Points in Choosing a Dairy Sire.

Every farmer who is in quest of a really good dairy bull should first of all satisfy himself that the constitution is good, bearing in mind that a robust constitution is of greater importance to-day than ever it was, because of the greater demands on it.

The intending purchaser should then follow the pedigree as far back as it will take him, and examine closely the milk records of the bul's ancestors, if such are available. In the case of the crossbred animal it is impossible to do this, as his ancestors are usually unknown.

Having satisfied himself as to the constitution, blood pedigree, and pedigree of performance of his prospective purchase, the purchaser may then look more closely into the general qualifications of the bull.

A bull whose dam has a very unshapely udder should be avoided. A perfect udder hides a lot of faults in the conformation of the body, and gives an otherwise indifferent cow an attractive appearance.

The head of the bull is the first thing that attracts the eye. It should be distinctly masculine in appearance, virile yet placid, with a general expression that might be described with the words: ''The whole world is mine.''

Prominent eyes, broad forehead, and full nostrils are indications of great nerve force and strong constitution. The neck should be well developed and the throat clean. Other desirable points are: Deep, well-rounded body; rather flat, clean thighs; thin, curved flank, and well developed testicles. The skin should be soft and elastic, and have a yellow-tinged surface. The hair should be soft to the touch, and comparatively short; the legs flat and clean, and comparatively short. Some breeders place great value on the design of the bull's escutcheon, and maintain that it should be large, commencing at the forepart of the scrotum, and spreading well out on the thighs.

If an intending purchaser has the opportunity and the necessary cash, it is desirable to purchase a bull who has already proved himself to be a producer of dairy stock of the highest quality, and even if a long price has to be paid for such an animal, it will prove less costly in the end than to purchase a bull calf whose prepotency is an unknown quantity. With care, a middle-aged bull of good constitution will last a number of years. The energy of valuable bulls is often sapped by allowing them to run with the herd. They should be kept separate, and allowed to serve a cow once only. It is necessary to introduce new bulls from time to time, but a good sire should not be parted with as long as his services prove fruitful.

If we examine the history of the greatest cows in the various pure breeds, we will find that, in the great majority of cases, success has been attained by adhering to line breeding—that is, breeding within one family or strain; and there is no greater proof of this contention than the success of the world-famous Melba family of the Darbalara Estate, New South Wales. It is granted that success is not in every instance assured by breeding from sires and dams possessing the highest dairy qualities, and why it should not be so is somewhat of a mystery. Explanations have been given by various authorities, but they are not very convincing. It may be accepted, however, that the great majority of dairy cattle, so bred, always account for a continued improvement in the herd records. At first sight it is natural to conclude that the sire and dam which produced the great Melba XV. would continue to produce females of like dairy qualities, but it is not always so, though the improvement in the Melba strain was continuous.

When it comes to deciding as to which is the best breed of bull for using in a crossbred herd, there is great variance of opinion; but the majority of farmers will agree that the purebred bull of a well-known dairy strain is preferable to the mongrel who has neither blood pedigree nor pedigree of performance—Primrose McConnell, in ''The New Zealand Farmer.''

### See the Land—Archbishop's Advice.

The greatest benefactor in Queensland would be the man who would turn the minds of the boys to the primary industries of the State, said Dr. J. Duhig, Archbishop of Brisbane, at the annual prize distribution at Nudgee College.

Education in the classroom was altogether too narrow, he continued. He thought it would be wise if students of secondary schools were given a fortnight's holiday at Easter to engage in specially organised excursions into the country districts, to see the working of the various primary industries. The boys knew very little of the vast natural wealth—including the mineral wealth—of Queensland.

**Care of the Working Horse.**

In most orchards the horse is the main source of power for drawing the various types of cultural implements used, and in order that such power shall be at its best (quite apart from the question of ordinary humanity), every care should be taken of the animal. Proper attention should be paid to his feeding and watering, grooming and stabling, or a satisfactory day's work cannot reasonably be expected.

Occasionally some discomfort is caused through want of thought. Some orchardists place a piece of hessian over the mouth of the horse during cultural operations to prevent his biting the trees as he passes along the rows. This hessian muzzle may prove very distressing to the animal, especially in hot weather, and the discomfort can be obviated or minimised by using coarse gauze or netting instead. The horse is then able to breathe more freely, even when labouring under a heavy load. Attention should also be paid to the harness, which should fit neatly, and steps should be taken to prevent any rubbing likely to result in painful sores. Special care should be taken in choosing a collar, as one that is too tight is very uncomfortable, while one that is too large is apt to chafe.

**Cheese Taints from Tainted Milk.**

It should be borne in mind that cheese is injured by taints, just as butter is. One of the greatest enemies of cheesemakers is the formation of gas in the vats, and one of the main causes of this evil is impure drinking water. Not only the cow's milk, but also her body, consists mainly of water, and when we realise this fact we can also realise that she must drink large quantities of water. If the water is impure it cannot be other than injurious to milk and its products.

Stagnant pools are undoubtedly one source of the trouble, not only because the water is more or less impure, but also because the cows carry a deal of mud, in both wet and dry form, into the milking shed. If at all possible, cows should drink from a running stream, or from troughs into which pure water is laid. The drinking troughs should be cleaned periodically, and a few handfuls of lime added to the water. A cow giving the enormous quantity of ten gallons milk, daily, must drink eight gallons to keep up her milk supply, and a considerable quantity besides to satisfy the demands of her body.

**Early Maize Crops.**

Early crops of maize which ripen in warm weather require to be harvested quickly in order to save loss from weevil in the field. There is, of course, a danger in harvesting this maize while too soft and storing it in a shed, as heating may develop which will favour further marked damage from weevil and moulds. Maize which is inclined to be soft or to contain excess moisture generally stores better if the husk is removed, and the removal of the husk in harvesting weevil-infested maize also has the effect of disturbing the weevils and shaking a large number free from the cobs, so that fewer weevils are taken into storage with the maize.

The best advice that can be given regarding such early harvested maize is to get it on to the market as quickly as possible, not attempting to hold it for feeding on the farm any longer than necessary, nor attempting to store it for a better price. In the first place, the price of maize from December or January to March or April is usually higher than it is later on in the winter or in spring. In addition to this, a loss in weight takes place from loss of moisture and from weevil damage, and in order to cut these losses it is far better business for the farmer to sell early harvested maize as soon as it can be shelled.

**Fertilizing Pastures—A Profitable Practice.**

The fertilizer treatment which gives the most economical results on the pastures at Berry Experiment Farm (South Coast, New South Wales) is half a ton lime every three years, 2 cwt. superphosphate every year, and also 2 cwt. sulphate of ammonia each year. With lime at £1 12s. per ton, superphosphate £5 per ton, and sulphate of ammonia £12 per ton, the cost of treatment works out at £2 per acre per year.

A comparison of the returns from the treated and untreated paddocks is interesting. An area in which the pastures were fertilized and properly managed produced at the rate of 219 lb. butter-fat per acre, which at 10s. per lb. works out at a return of £9 2s. 6d. per acre per year. An area which was not fertilized but on which the pastures were properly managed produced at the rate of 118 lb. butter-fat per acre at 10d. per lb., equalling a return of £4 18s. 4d. per acre per year, as compared with a return of only 25 lb. butter-fat at 10d. for £1 0s. 10d. per acre, from a paddock that was neither fertilized nor managed.

In addition to the improved return, the treated land is still better at the end of the season than the untreated land, and the cattle are improved in every respect for having grazed on the more nutritious pasture.

**Points in Poultry Management.**

While most poultry farmers endeavour to grow crops to provide a suitable supply of green feed for their birds all the year round, it frequently happens that, at times, through drought or lack of water in the summer months or the ravages of plant pests or diseases, green feed is not available.

The common belief of poultry farmers is that green feed is an additional foodstuff which exerts a beneficial effect on health and egg production, and that its temporary absence can be suffered without any great detriment to health.

Within recent years, however, it has been discovered that in green feed there is a substance, known as vitamin A, which is essential to the life of the birds, and that unless this substance is provided, a definite disease of the eyes, throat, gullet, and windpipe may result and cause severe mortality. The birds may show poor development, unthriftiness, lessened egg-production, leg-weakness, bad feathering and poor fertility and hatchability of their eggs.

This "green feed deficiency disease" has certain characters which might suggest an infectious disease, but it is definitely non-communicable and is caused by the deficiency of vitamin A, when green feed or other foodstuffs, such as cod liver oil and carrots, which contain this vitamin, are not included in the ration for several weeks.

That it is an economic proposition to supply vitamin A in some other substance than green feed when the latter is not available has been proved by the increased egg-production and the cessation of mortality that follows the feeding of such foodstuffs.

The treatment, therefore, consists of the immediate supply of the lacking vitamin, all fowls on the deficient diet being given either green feed, carrots, or cod-liver oil. By this means all sick fowls may be saved without any increase in the trouble, and rapid improvement of the whole flock is effected within seven days.

The obviously sick fowls should be treated individually, each bird being given, by means of a dropper, one-quarter of a teaspoonful of reliable cod-liver oil daily. Less seriously affected fowls and those not already showing symptoms should be given cod-liver oil at the rate of 4 per cent. in the mash for the first week, and thereafter at the rate of 2 per cent. The oil should be added daily to the mash, as oil-containing mashes lose in efficiency on keeping.

Green feed should be provided liberally again as soon as it is available, and this will ensure the prevention of the disease.—A. and P. Notes, New South Wales Department of Agriculture.

**Silver Medals for Pigs.**

Through the courtesy of the National Pig Breeders Association of England, the Australian Stud Pig Breeders' Society and the Royal National Association of Queensland have received advice of the donation of silver medals for the best boar and the best sow in each of the following breeds exhibited at the Royal National Exhibition in August, 1933—viz., Berkshires, Tamworths, Large Whites, Middle Whites, Wessex Saddlebacks.

The National Pig Breeders' Association in offering the medals are, in addition to fostering the interests of these important breeds, extending to Australian breeders similar priveleges to those enjoyed by British breeders of stud pigs. The donations will be of considerable value, and will be competed for by the principal breeders in the northern State.

**Productive Pigs.**

A world's record in weight for age from progeny of one sow in under two years is claimed for the Large White sow, Vaucluse Jewel 5th, a registered sow bred in Victoria, and from which a large number of stud stock have been selected. At twenty-six weeks her litters weighed—

First litter at twenty-six weeks weighed 2,400 lb.
Second litter at twenty-six weeks weighed 2,506 lb.
Third litter at twenty-six weeks weighed 2,375 lb.
Fourth litter at twenty-six weeks weighed 3,187 lb.

—a total litter weight of 10,468 lb. within two years. These pigs were produced and handled under official control, the figures being certified to by Victorian Government officers. The sow herself is a prominent prize winner of a very prolific and productive type.

### Dry Salting a Pig.

The best months for curing a pig are May, June, July, August. After the pig has been cut in suitable pieces, remove the ham bone, insert a few holes in the thick part of the hams with a steel, and work some salt and saltpetre into the hole with the steel. Then rub the pieces well with coarse salt and stack them, flesh side up. After two days change the position, putting the bottom pieces at the top after rubbing with a mixture made up of the following:—3 lb. brown sugar, 7 lb. salt, 2 oz. saltpetre, 1 oz. allspice, 1 dessertspoon of carb. soda. This mixture will cure 1 cwt. of meat. Rub the pieces twice a week, each time changing the position. Leave the sides in a fortnight and the hams three weeks. Wash in luke-warm water and hang to dry, then smoke. Afterwards rub over with olive oil.

### Size of the Red-backed Spider.

Mr. J. F. Dudley, of Camp Mountain, Dayboro' line, writes:—"There was an article in your Journal of September dealing with the red-backed spider. I should like to correct the statement that the spider's body is no bigger than a green pea. On a farm on the Warwick-Killarney road where I worked for a year or so some time back, my boss did not believe in killing them, as they are great fly-catchers, and so they had a free 'go.' I have seen dozens three times as big as peas—in fact, the smallest matured ones were bigger. Along the coast they are on the small side, but even here . . . you will repeatedly find them bigger than a pea."

### Early Culling of the Poultry Flock.

While in normal times the matter of culling to any extent would not be considered until towards the end of December, the position is now such that no poultry farmer can afford to keep hens which are not capable of laying up to expectations for this time of the year. As a guide to the production that might reasonably be expected from a flock comprising half first-year and half second-year hens, the following table, based on a twelve-dozen eggs per hen per annum basis, may be helpful for checking up on the flock:—

| | Eggs per hen. | | Eggs per hen. |
|---|---|---|---|
| May | 4 | November | 17 |
| June | 6 | December | 16 |
| July | 10 | January | 13 |
| August | 16 | February | 11 |
| September | 19 | March | 7 |
| October | 19 | April | 6 |

Anything in the nature of wholesale culling should not be undertaken (it should not be necessary on a well-managed farm), as this would only result in swamping the market and depressing prices. Moreover, in doing so, many hens which were only temporarily off laying would be sacrificed.

The best course to follow before deciding upon the number of birds which should be culled is to make a count of the hens in the various pens, and keep a record of the laying for a period of at least a week, and if the rate of production is much below that shown for the particular month in the above table, a close investigation should be made to find out if it is due to faulty management or to conditions which may be responsible for a temporary lull in laying. What is required is a judicious elimination of the hens which are not likely to continue laying throughout the rest of the flush season. This will include mainly those which are not sound in health nor of good physique and also those which have become coarse, both among the first and second year birds. In the good layer will be noted an alertness in appearance, clean face, fine skull, and prominent eye. The poor type shows the reverse, and although some birds of this class may be laying now they are not the sort that will continue, and nothing much will be lost by disposing of them, as they will bring more in the market now than after Christmas, unless, of course, low egg prices cause a rush to market of all and sundry hens which action cannot be too strongly deprecated.

The best plan for those who are not experienced in culling is to pick out all doubtful birds and place them in a small pen for a week, and if in that time only a few eggs are laid it can be taken that the poor layers have been selected. If, on the other hand, a large number of eggs is laid, it will be a matter of going through them again to ascertain which are laying, and it is here that the condition of the pelvic bones will assist. The layers will be found to have wide-apart pelvic bones and the abdomen will be full and soft, whereas those of the non-layers will be contracted.—A. and P. Notes, New South Wales Department of Agriculture.

# The Home and the Garden.

## OUR BABIES.

*Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.*

### SUMMER SAFEGUARDS.

What queer delusions many people cherish! Many of our friends in the Southern States still imagine that the Queensland summer is hotter than their own, although the temperature records every year rise higher in Melbourne and Adelaide than in the greater part of this State. Even in Sydney it is not realised that every February they enjoy the same moist heat as we do on the Queensland coast. Our summer lasts longer—that is the only difference.

So far as infants and young children are concerned our summer heat is perfectly harmless. It is not summer heat, but summer diseases that are to be feared. Those diseases that render most tropical countries unsuitable for permanent occupation by white races are here fortunately absent, or if not absent easily controllable. Malaria exists only in a few localities and in a mild form. Hookworm also is strictly limited in its area and is easily controlled by simple sanitary precautions. The diarrhœal infections, which used to cause such heavy mortality among infants in the summer all over the world, are here no longer a frequent cause of death. By breast feeding, by greater care in the preparation of food, in the sterilisation of utensils by boiling, and by the exclusion of flies, the diarrhœal mortality has been reduced to a very low rate.

We must not relax these precautions. Diarrhœa still threatens us every summer, and if we are not careful will enfeeble or kill our babies as surely as it used to do twenty or thirty years ago. An intelligent understanding of its causes is the first condition necessary for their safety.

Diarrhœa is the result of something irritating in the bowel, which it is trying to get rid of. This something is either more food than can be digested and absorbed, unsuitable and irritating food, or quantities of infectious bacteria. For practical purposes we may distinguish food diarrhœas from infectious diarrhœas, remembering that the distinction is not always clearcut.

#### Food Diarrhœas.

In hot weather we need more water to drink and less food to eat. This is true of babies as well as other people. We need less fuel to maintain bodily heat. Mothers sometimes fail to distinguish between hunger and thirst in babies, and yet it is easy. Thirst is satisfied by plain water. Milk is a food, and thirst may induce an infant to take too much of it when he is not hungry.

We do not wean babies during the hot weather if we can avoid it. The breast-fed babe is much safer than the babe artificially fed. We do not try experiments with new sorts of food at this time or, at least, we try them very cautiously. We are very careful of our milk supply. If the milk is not clean to begin with (not an uncommon occurrence), or if it is kept too long in hot weather, great numbers of bacteria grow in it. These may be killed by boiling, but that does not make the milk clean and fresh. Stale and dirty milk is a common cause of loose motions.

The treatment of food diarrhœas is very simple. Give a teaspoonful of castor oil to clear out the bowels. Stop all milk and other foods. Give nothing but very thin barley water slightly sweetened or plain water, until the motions begin to improve. Then give whey made with junket tablets. Babies over nine months

may have water-arrowroot, water-sago, or if they have teeth a small finger of bread baked hard in the oven. Do not give milk until the motions are much better, and then in small quantities to begin with.

### Infectious Diarrhœas.

Usually the infant is very ill at the beginning. Sometimes the disease is deceitfully mild at first, but does not improve with simple treatment. For these cases medical advice should be sought at once. Especially is this necessary when the passage of blood and slime with straining shows that it is a case of dysentery.

The prevention of infectious diarrhœa is the mother's responsibility. The milk must be either boiled or pasteurised. The milk jugs should be scalded. The bottles and teats must be carefully cleaned and boiled. All must be most carefully screened from flies, which carry the infection from house to house. The baby that sucks a dummy, whether breast-fed or bottle-fed, is in danger of infection from flies. The only safeguard is to burn the dummy.

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## DIETETIC VALUE OF FRUIT.

*Following is an extract from a special article in "The Farmer" (Pietermaritzburg, Natal, South Africa), by Dr. Redvers J. Blatt, B.Sc., Ph.D.*

THIRTY years ago everything revolved round proteins, carbohydrates, fats, and ash (mineral salts). Interest in proteins exceeded all else, since without protein life is impossible. We find, however, that other things, such as iron, iodine, and vitamins are equally necessary.

At that time we were led to believe that any food containing proteins, carbohydrates, fats, ash, and water in appropriate portions was a satisfactory and complete food. No mention was made of other substances which in the most minute quantities are necessary, such as iron, mercury, manganese, and molybdenum (a chromium), and which act as catalysts (or something to hasten a reaction although not taking part in it).

To-day there is a tendency to ascribe certain diseases to lack of vitamins, while lack of iodine in the diet is regarded as being responsible for a specific disease.

### Caloric Value.

Food values are frequently expressed in terms of calories. A calory is the amount of heat necessary to raise a litre of water 1 degree centigrade or a pound of water 4 degrees Fahr. In general terms it may be stated that a healthy man weighing 150 lb. in a temperate climate, and in the performance of ordinary work, requires daily a food equivalent of approximately 3,000 calories. While it is true that the real value of any food is not always represented by the heat units or calories, at the same time the total food value is so indicated. The value of a food as a source of energy varies directly with its caloric value.

### Dietetic Value.

Protein foods are more adapted to the development of tissue than to the quick production of heat. On the other hand, carbohydrates are less tissue-forming substances, but are incomparably more effective in supplying the heat-giving materials. In a crude way we might say that the proteins are the foods which make good the losses due to wear and tear in the machinery of the body, while the carbohydrates are the foods which keep the machinery in motion and do work.

The ash consists of various minerals, all of which serve useful purposes in the body economy. While only relatively small quantities are necessary, they are essential to the body needs. Fruits and greet vegetables contain appreciable quantities of these valuable mineral salts, consisting chiefly of the phosphates, sulphates and Chlorides of potash, soda, magnesia, and lime, as well as significant amounts of iron. These salts are present in fruits and green vegetables, mainly as base-forming minerals, while in some other foods they are mainly present in an acid-forming condition.

**Vitamins.**

In the first decade of the present century, when food values began to be studied by animal experimentation, it became evident that something more than mere calculated amounts of protein, carbohydrate, fat, and salts was required to support life, promote growth, and ward off disease.

In 1910 Funk called attention to ''a group of indispensable complexes'' which he named ''vitamins.'' It was not until 1915, however, that the importance of the discovery was realised. Funk's work furnished a key to the existing confusion and seeming contradiction in experimental results.

What are vitamins? Vitamins, also known as ''accessory factors,'' are somewhat difficult to explain. We know more about their reactions and uses than about their composition. While it is important that the proper balance of carbohydrates, protein, fat, and mineral salts be adhered to, other essential vitamins must be provided if health is to be maintained.

**Six Known Vitamins.**

Research workers, particularly Rosenheim, Wendaus, Webster, and Hess, have learned much about vitamins. According to their work it is more than likely that vitamins will soon be isolated and artificially manufactured.

The vitamins are named after the letters of the alphabet. Vitamin A is found in most animal fats, such as butter, milk, cheese, beef or mutton fat, green vegetables and fruit, and all vegetables of a yellow colour. Vitamin A is called the anti-rachitic or anti-ophthalmic vitamin, and has not been isolated yet. Its chemical nature is quite unknown. If it is absent in the diet, growth ceases and the body becomes highly susceptible to colds, influenza, pneumonia, tuberculosis, and rickets; also the eyes become ulcerated.

Vitamin B is the anti-neuritic, anti-beri-beri, or water-soluble vitamin, and is characteristically present in the seeds of plants and the eggs of animals. Cereals, comprising the whole grain, are rich in Vitamin B. It is associated with the husks (bran) of yellow but not white mealies, with very many fruits, vegetables, and with yeast. It protects the nervous system, hence is called the anti-neuritic vitamin. If Vitamin B is withheld from the diet, paralysis or beri-beri is the result. In the Orient, where polished rice is consumed regularly, beri-beri is a common complaint.

**Anti-Scorbutic.**

Vitamin C is the anti-scorbutic vitamin, sometimes called water-soluble C, and is present in varying quantity in fruits, vegetables, green leaves, and in living or freshly killed animal tissues. The citrus fruits—viz., orange, lemon, and grape-fruit—are particularly rich in Vitamin C, which is probably present in all living turgid cells, whether of animal or vegetable tissues.

Vitamin D we know quite a lot about. It occurs in most plant and animal sterols, being formed by ultra-violet rays upon ergosterol (the sterol of ergot and yeast). It manufactures bone from gristle, and thus prevents rickets in children. This is the only vitamin the chemical nature of which is known. The other vitamins have not yet been isolated.

Vitamin E, first known as Vitamin X, has only recently been discovered. Vitamins A and B, even in liberal diets, give rise to sterility if Vitamin E is absent, both males and females being affected. The richest source of Vitamin E is the oil of the wheat germ, a daily dosage of 250 milligrams being sufficient to prevent sterility in rats. Vitamin E is also found in oats, corn, coconuts, olives, cotton-seed oil, egg yolk, and lettuce.

Recently another vitamin, named G, has been discovered. It appears to have an effect on growth and in maintaining a healthy condition of the skin and mucous membrane of the mouth.

It must be remembered that vitamins are not foods, but catalysts essential in maintaining health. They react on the other constituents of foods, proteins, &c., but themselves are useless. Without them food is useless.

**Vitamins in Fruit.**

As far as vitamins are concerned, fruit, in general, is most valuable. Fruit is a great source of Vitamins A, B, and C, and even Vitamin E, since olives contain this vitamin. There are, however, certain fruits which are far more valuable than others—namely, banana, citrus fruits, and the avocado—if general utility is taken into consideration.

Citrus fruits are probably the greatest source of vitamins. It has been demonstrated by many research workers that oranges, lemons, and grapefruit contain Vitamins A, B, and C. The pre-eminent value of citrus fruits as a preventive and curative of scurvy, whether latent or declared, should lead eventually to these fruits being regarded not as a luxury but as a necessity for the maintenance of health.

### Minerals.

It is a known fact that phosphorus is widely distributed in the body, and is essential to the living cells, as are the proteins, while calcium and iron are necessary for the development of bone and blood. Bananas, apples, and oranges contain appreciable quantities of phosphorus, calcium, and iron. The onion, like most green vegetables, is of value in the diet chiefly for the mineral salts which it contains. When vegetables are unusually costly there is a danger that the health of the community may suffer from a deficiency of base-forming minerals in the diet. It is important, therefore, to call attention to the fact that apples, bananas, and oranges may be used as substitutes for vegetables. They contain the same mineral matters in varying proportions.

### Fats.

The laxative properties of most fruits depend on the stimulating effects of the fibre in the wall of the intestine, and partly on the organic acids and minerals. The avocado should perhaps prove to have laxative qualities of a peculiar type, possessing as it does the combination of the usual fruit principles and that of fat or oil, which has a tendency to soothe and to lubricate the intestine even while it acts as a mild laxative. The avocado is a natural combination of these two types of foods—as if fruit and olive oil had been chemically combined by Nature.. As far as fat is concerned, the olive and the avocado are the most important. The fat content of the avocado varies from 10 to 31 per cent., and that of the olive from 20 to 28 per cent.

In addition to the citrus fruits the banana and avocado are two outstanding fruits.

### The Banana.

The banana is a delicacy, but also an important and substantial food. In food value it ranks highest among all fresh fruits, and surpasses most of the vegetables. Apples, pears, peaches, melons, and berries are nearly nine-tenths water, whereas the banana is one-fourth solids. The banana is a staple food, and in the tropics it takes the place of potatoes and cereals. The banana is essentially a carbohydrate food, but is valuable also for its minerals. The banana, when ripe, is one of the easiest foods to digest in the whole dietary, and reaches the consumer in a germ-proof package.

### The Avocado.

The avocado contains twice as much mineral matter as that yielded by any other fruit, and as far as protein in fresh fruits is concerned, the avocado stands in the lead. The total dry matter in the avocado is greater than that noted for any other fresh fruit.

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## "AN ORANGE A DAY."

According to reports of the autumn session of the Middlesex Hospitals Medical School, the saying that "an apple a day keeps the doctor away" is due to be superseded by the saying "An orange a day keeps the doctor away."

"The apple is a most delightful fruit," said Professor V. H. Mottram, Professor of Physiology of the University of London, and an authority on foods, "yet it is only a sweetmeat and is negligible as nourishment or as a medicine. On the other hand, the orange is most valuable as nourishment, and medicinally. It is anti-scorbutic, and rich in the vitamin contained in sunlight. It also has calcium, which is essential to bone-building. Recent experiments indicate that oranges are nearly the equal of milk in nourishment."

## FOOD VALUE OF BANANAS.

When it is considered that the banana is an article of diet in every country of the world, and that the inhabitants of some portions of the globe subsist on it almost entirely, it is strange to find some people under the impression that bananas should be eaten sparingly and only by people with good digestion, runs the introduction to the banana recipe booklet issued by the Commonwealth Banana Committee.

It is true that the banana, eaten in an *unripe* state, will, in common with all fruits, cause intestinal disturbance to a greater or less degree. The *ripe banana*, however, is not only a fruit of remarkably high food value, but is amazingly easy to digest. It can be eaten with safety and relish by everyone from infancy onwards.

No fruit compares with the ripe banana in food values; no fruit approaches it in regard to digestibility and easy assimilation; no fruit and very few foodstuffs approach it in regard to value for money expended. Writing of the banana, Professor S. C. Prescott (Massachusetts Institute of Technology) says: "The ripe banana contains all the classes of food materials required for the human body. Although the amounts of protein and fat are slightly too low to constitute a perfectly balanced ration, the combination of bananas with milk, or its utilisation to supplement a diet containing a small amount of meat will produce a ration which is ample to take care of the body needs."

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## SUMMER SALADS.

Following are some recipes given by Miss Bowden in an address on "Commonsense in Summer Meal Preparation," at a meeting of a branch of the Agricultural Bureau of New South Wales:—

Tomatoes with chopped parsley and young onions.

Tomatoes (small) peeled and quartered, with diced cucumber, pieces of cheese, hearts of lettuce, moulded spinach, diced beetroot, and sliced egg.

Asparagus tips, chopped tomato, and broken cauliflower.

Diced beetroot with watercress, shredded cabbage or lettuce, cauliflower separated into flowerets with quartered hard-boiled eggs.

Diced cold boiled potatoes, finely-chopped onion, chopped celery, salt.

Cucumbers cut lengthwise and steamed until tender. Scoop out the seeds and fill with prawns or lobster mixed with mayonnaise. Serve these cucumber boats on lettuce. Decorate with whole prawns and sliced olives.

*Red Heart Salad.*—Set tomato jelly in a shallow pan and cut with a heart-shaped pastry cutter, arrange with hearts of lettuce.

Artichokes cooked and quartered served with thinly-sliced oranges and chopped celery.

*Stuffed Beets.*—Scoop out the centre and fill with chopped cucumber, radishes, celery, and olives mixed with dressing.

*Stuffed Tomatoes.*—Scoop out the centre and fill with chopped tomato pulp, diced cucumber, salt, pepper, a little grated horse-radish and dressing, or chopped tomato, celery, raisins or sultanas, a very little green onion, a finely chopped sour apple, and dressing.

Chopped tomato, cucumber, cooked sweet bread (any white meat may be used instead), salt, pepper, capers, with dressing.

*A Way of Serving Tomatoes.*—Cut in halves and put together again with a layer of cream cheese, seasoned and moistened with salad dressing. Top with a sprig of parsley.

Banana, beetroot, cucumber, grated nut, and lettuce.

Orange, tomato, beetroot in mayonnaise jelly; serve on lettuce.

Pineapple, tomato, cheese in mayonnaise jelly; serve on lettuce.

Apple, celery, parsley, walnut, on lettuce.

Beetroot and green peas in mint jelly.

*Combination Salad.*—Tomato wedges, sliced cucumber, onion rings; sprinkle with vinegar and let stand for some hours; serve on lettuce with French dressing.

*Green Vegetable Salad.*—Cooked string beans and peas, diced cucumber, minced onion; sprinkle with vinegar and let stand for some hours; serve on lettuce with French dressing.

*Chiffonade Salad.*—Cubes of cooked beetroot, sliced hard-boiled eggs, minced onion; sprinkle with vinegar and let stand for some hours; serve on lettuce with mayonnaise.

*Carrot and Cabbage Slaw.*—New carrots, cut in long fine strips; cabbage finely shredded mixed with vinegar; combine carrots and cabbage by tossing together lighthly with salad dressing; serve thoroughly chilled.

*Golden Glow Salad.*—Diced pineapple, grated raw carrot, grated nut; on lettuce with mayonnaise.

*Other Salads.*—Macaroni, salmon, sliced egg and minced onion; served on lettuce.

Baked apples, served with nuts and raisins on lettuce, garnished with currant jelly and mayonnaise.

Grapefruit and orange sections arranged on lettuce with fine strips of dates and figs; dressing.

Celery, cheese, and pineapple on lettuce; serve with dressing.

*Pears and Asparagus Salad.*—Half a pear for each serving; four or five asparagus tips, salt and pepper, and dressing; serve on lettuce.

*Jellied Mayonnaise.*—Any salad vegetables may be set in mayonnaise jelly, the receipe for which is as follows:—

*Ingredients.*

3 teaspoons gelatine.
3 tablespoons condensed milk.
2 dessertspoons vinegar.
1 egg (hard-boiled).
¼ teaspoon mustard.
1 teaspoon sugar.
½ teaspoon salt.
½ cup hot water.

*Method.*

Crush yolk of egg and sugar together in a basin, add mustard, salt, pepper, vinegar, and milk. Mix all thoroughly together. Dissolve gelatine in hot water, add to other liquid and blend. Pour on to prepared salad ingredients.

## POISON IN PAINT—DANGER TO CHILDREN.

Lead-poisoning is by far the most common cause of the frequency of nephritis in Queensland, in the opinion of Dr. L. J. Jarvis Nye, of Brisbane, who, in "Chronic Nephritis and Lead-poisoning," a book just published by Angus and Robertson Ltd., of Sydney, urges the complete prohibition by law of the use of lead paint.

Dr. Nye gives figures to show that the increased death rate from chronic nephritis among young people in Queensland is a tragic reality, presenting an important field for research. Since 1928 he has been able to produce evidence that lead-poisoning in childhood has played an important part in causing the increased mortality.

"Of 87 patients questioned by me 71 said the paint on the verandas of houses occupied by them in their childhood was dry and powdery," he writes. "Forty-six were nail-biters or thumb-suckers, and in seven cases the parents said the child had been in the habit of licking the rain-drops from the veranda railings. Obviously the majority had been exposed to the risk of lead-poisoning."

Dr. Nye finds no support for suggestions that the frequency of nephritis in Queensland is traceable in any considerable degree to chronic tonsillar infection, syphilis, measles, diphtheria, malaria, or filaria, or to climatic conditions.

Investigating the possible sources of lead-poisoning, he dismisses the theory that the town water supply might be responsible to some extent, and comes to the conclusion that the most likely source is the paint on the walls of the houses and on the railings of the verandas. He attributes the lessening of the incidence of plumbism in Queensland to the education of the public on the subject, the legislative prohibition of the use of lead paint on veranda railings, the earlier recognition and treatment of cases by medical men, improved hygiene in the home and at school, the work of the Creche and Kindergarten Society, a change in the type of houses, and the introduction of an enormous number of non-poisonous paints.

# Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be grown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

# Orchard Notes for January.

## THE COASTAL DISTRICTS.

ALL orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one-sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of this fruit are to hand that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then why "spoil the ship for a ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

# CLIMATOLOGICAL TABLE—OCTOBER, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

| Districts and Stations. | Atmospheric Pressure. Mean at 9 a.m. | Shade Temperature. Means. Max. | Means. Min. | Extremes. Max. | Date. | Min. | Date. | Rainfall. Total. | Wet Days. |
|---|---|---|---|---|---|---|---|---|---|
| *Coastal.* | In. | Deg. | Deg. | Deg. | | Deg. | | Points. | |
| Cooktown .. .. .. | 29·91 | 84 | 73 | 86 | 12, 13, 25 | 68 | 1, 2 | 103 | 5 |
| Herberton .. .. .. | .. | 78 | 57 | 85 | 25 | 46 | 22 | 186 | 5 |
| Rockhampton .. .. | 30·03 | 83 | 63 | 89 | 30 | 55 | 27 | 407 | 6 |
| Brisbane .. .. .. | 30·07 | 79 | 62 | 89 | 21 | 55 | 20 | 382 | 13 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. .. | 30·03 | 79 | 56 | 92 | 22, 30 | 49 | 19 | 573 | 9 |
| Stanthorpe .. .. | .. | 73 | 50 | 85 | 30 | 40 | 6 | 318 | 8 |
| Toowoomba .. .. | .. | 75 | 54 | 90 | 30 | 45 | 9 | 267 | 9 |
| *Mid-interior.* | | | | | | | | | |
| Georgetown .. .. | 29·91 | 95 | 60 | 100 | 6, 7, 8 | 54 | 28, 30, 31 | 50 | 4 |
| Longreach .. .. .. | 29·97 | 91 | 61 | 101 | 4, 31 | 47 | 27 | 158 | 3 |
| Mitchell .. .. .. | 30·01 | 82 | 54 | 95 | 31 | 41 | 15 | 263 | 5 |
| *Western.* | | | | | | | | | |
| Burketown .. .. | 29·91 | 94 | 69 | 98 | 12, 29 | 63 | 1, 27, 29 | 45 | 1 |
| Boulia .. .. .. | 29·95 | 93 | 61 | 105 | 24 | 52 | 27 | Nil | .. |
| Thargomindah .. .. | 29·98 | 87 | 62 | 102 | 22, 31 | 53 | 27 | 43 | 2 |

# RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING OCTOBER, 1933, AND 1932, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. Oct. | No. of Years' Records. | Total Rainfall. Oct., 1933. | Oct., 1932. |
|---|---|---|---|---|
| *North Coast.* | In. | | In. | In. |
| Atherton .. .. | 0·89 | 32 | 1·86 | 0·46 |
| Cairns .. .. | 2·12 | 51 | 2·40 | 0·49 |
| Cardwell .. .. | 2·06 | 61 | 2·58 | 1·15 |
| Cooktown .. .. | 1·05 | 57 | 1·03 | 0 |
| Herberton .. .. | 0·97 | 47 | 1·86 | 1·10 |
| Ingham .. .. | 1·92 | 41 | 2·84 | 0·52 |
| Innisfail .. .. | 2·98 | 52 | 15·14 | 0·69 |
| Mossman Mill .. | 3·05 | 20 | 2·09 | 0·77 |
| Townsville .. .. | 1·39 | 62 | 1·20 | 0·10 |
| *Central Coast.* | | | | |
| Ayr .. .. .. | 0·98 | 46 | 0·85 | 0 |
| Bowen .. .. | 1·03 | 62 | 2·02 | 0 |
| Charters Towers .. | 0·69 | 51 | 1·92 | 0·60 |
| Mackay .. .. | 1·67 | 62 | 1·45 | 0·21 |
| Proserpine .. .. | 1·69 | 30 | 2·76 | 0·08 |
| St. Lawrence .. | 1·73 | 62 | 4·66 | 1·53 |
| *South Coast.* | | | | |
| Biggenden .. .. | 2·25 | 34 | 7·32 | 4·37 |
| Bundaberg .. .. | 2·06 | 50 | 4·48 | 6·23 |
| Brisbane .. .. | 2·55 | 82 | 3·82 | 2·98 |
| Caboolture .. .. | 2·48 | 46 | 4·36 | 3·01 |
| Childers .. .. | 2·54 | 38 | 8·18 | 5·17 |
| Crohamhurst.. .. | 3·23 | 40 | 5·99 | 2·45 |
| Esk .. .. .. | 2·55 | 46 | 1·77 | 4·74 |
| Gayndah .. .. | 2·36 | 62 | 4·87 | 3·58 |
| Gympie .. .. | 2·67 | 63 | 5·33 | 3·09 |
| Kilkivan .. .. | 2·59 | 54 | 3·76 | 3·48 |
| Maryborough .. | 2·66 | 61 | 8·28 | 5·90 |
| Nambour .. .. | 2·92 | 37 | 6·33 | 3·34 |
| Nanango .. .. | 2·27 | 51 | 1·45 | 3·33 |
| Rockhampton .. | 1·74 | 62 | 4·07 | 1·22 |
| Woodford .. .. | 2·53 | 46 | 3·72 | 7·50 |

| Divisions and Stations. | Average Rainfall. Oct. | No. of Years' Records. | Total Rainfall. Oct., 1933. | Oct., 1932. |
|---|---|---|---|---|
| *Central Highlands.* | In. | | In. | In. |
| Clermont .. .. | 1·31 | 62 | 2·15 | 1·00 |
| Gindie .. .. | 1·34 | 34 | 2·10 | 1·54 |
| Springsure .. .. | 1·62 | 64 | 2·69 | 2·71 |
| *Darling Downs.* | | | | |
| Dalby .. .. | 2·02 | 63 | 5·73 | 2·92 |
| Emu Vale .. .. | 2·17 | 37 | 2·91 | 3·30 |
| Hermitage .. .. | 1·90 | 27 | 1·77 | 2·83 |
| Jimbour .. .. | 1·89 | 45 | 2·45 | 2·52 |
| Miles .. .. | 1·96 | 48 | 5·67 | 2·20 |
| Stanthorpe .. .. | 2·54 | 60 | 3·18 | 2·48 |
| Toowoomba .. | 2·54 | 61 | 2·67 | 2·62 |
| Warwick .. .. | 2·30 | 68 | 2·62 | 3·63 |
| *Maranoa.* | | | | |
| Roma .. .. | 1·72 | 59 | 3·35 | 1·11 |
| *State Farms, &c.* | | | | |
| Bungeworgorai .. | 1·35 | 19 | 3·09 | 0·71 |
| Gatton College .. | 2·00 | 34 | 1·56 | 2·60 |
| Kairi .. .. | 1·00 | 19 | 1·82 | 0 |
| Mackay Sugar Experiment Station | 1·39 | 36 | 1·29 | 0·28 |

GEORGE G. BOND, Divisional Meteorologist.

# ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

## TIMES OF SUNRISE, SUNSET, AND MOONRISE.

### AT WARWICK.

| | December. 1933. | | January. 1934. | | MOONRISE. Dec. 1933. | MOONRISE. Jan. 1934. |
|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets. | Rises. | Rises. |
| | | | | | p.m. | p.m. |
| 1 | 4·49 | 6·33 | 5·0 | 6·50 | 5·58 | 7·17 |
| 2 | 4·49 | 6·33 | 5·1 | 6·50 | 6·53 | 8·0 |
| 3 | 4·49 | 6·34 | 5·2 | 6·50 | 7·45 | 8·27 |
| 4 | 4·49 | 6·35 | 5·2 | 6·50 | 8·33 | 9·8 |
| 5 | 4·49 | 6·36 | 5·3 | 6·50 | 9·19 | 9·37 |
| 6 | 4·49 | 6·37 | 5·3 | 6·50 | 10·0 | 10·6 |
| 7 | 4·50 | 6·37 | 5·4 | 6·51 | 10·34 | 10·35 |
| 8 | 4·50 | 6·38 | 5·5 | 6·51 | 11·5 | 11·7 |
| 9 | 4·50 | 6·38 | 5·6 | 6·51 | 11·35 | 11·38 |
| 10 | 4·50 | 6·39 | 5·6 | 6·51 | .. | .. |
| | | | | | a.m. | a.m. |
| 11 | 4·50 | 6·39 | 5·7 | 6·51 | 12·5 | 12·17 |
| 12 | 4·51 | 6·40 | 5·8 | 6·51 | 12·35 | 1·4 |
| 13 | 4·51 | 6·40 | 5·9 | 6·51 | 1·8 | 2·0 |
| 14 | 4·51 | 6·41 | 5·10 | 6·51 | 1·45 | 3·2 |
| 15 | 4·52 | 6·41 | 5·11 | 6·51 | 2·26 | 4·12 |
| 16 | 4·52 | 6·42 | 5·12 | 6·52 | 3·21 | 5·26 |
| 17 | 4·52 | 6·42 | 5·13 | 6·52 | 4·23 | 6·39 |
| 18 | 4·53 | 6·43 | 5·13 | 6·52 | 5·32 | 7·48 |
| 19 | 4·53 | 6·44 | 5·14 | 6·52 | 6·43 | 8·52 |
| 20 | 4·53 | 6·44 | 5·15 | 6·52 | 7·54 | 9·54 |
| 21 | 4·54 | 6·45 | 5·15 | 6·52 | 9·3 | 10·53 |
| 22 | 4·54 | 6·45 | 5·16 | 6·52 | 10·8 | 11·53 |
| | | | | | | p.m. |
| 23 | 4·55 | 6·46 | 5·16 | 6·52 | 11·8 | 12·41 |
| | | | | | p.m. | |
| 24 | 4·55 | 6·47 | 5·17 | 6·51 | 12·6 | 1·47 |
| 25 | 4·56 | 6·47 | 5·18 | 6·51 | 1·8 | 2·42 |
| 26 | 4·56 | 6·48 | 5·19 | 6·50 | 1·59 | 3·36 |
| 27 | 4·57 | 6·48 | 5·20 | 6·50 | 2·57 | 4·27 |
| 28 | 4·58 | 6·49 | 5·20 | 6·49 | 3·53 | 5·15 |
| 29 | 4·58 | 6·49 | 5·21 | 6·49 | 4·49 | 5·59 |
| 30 | 4·59 | 6·50 | 5·22 | 6·48 | 5·42 | 6·37 |
| 31 | 5·0 | 6·50 | 5·23 | 6·47 | 6·31 | 7·10 |

## Phases of the Moon, Occultations, &c.

| | | | |
|---|---|---|---|
| 2 Dec. | ○ | Full Moon | 11 30 a.m. |
| 10 ,, | ☽ | Last Quarter | 4 23 p.m. |
| 17 ,, | ● | New Moon | 12 52 p.m. |
| 24 ,, | ☾ | First Quarter | 6 8 a.m. |

Apogee, 4th December, at 11.18 p.m.
Perigee, 17th December, at 10.6 p.m.

Saturn rises at 11.31 a.m. and sets at 1.0 a.m. on the 1st; on the 15th it rises at 10.27 a.m. and sets at 11.55 p.m.

The Southern Cross will disappear in the early evening hours in November, even in Southern Queensland, where, however, its reappearance in the south-south-east will occur shortly before midnight near the end of the month to observers eastward of the 145th meridian.

Kappa Geminorum, magnitude 3.6, will be occulted before 3 a.m. on the 6th, when a little west of the meridian.

When Mercury rises at 1 hour 11 minutes before the Sun on the 6th it will be at its greatest western elongation, 21 degrees.

On the 13th Jupiter will be in conjunction with the Moon, about 5 a.m., when high up in the N.N.E. It will then be broad daylight, but about 2 hours earlier Jupiter may be seen about 6 degrees (the length of the Southern Cross) north of the crescent Moon. With Spica about the same distance to the east an interesting triangle will be formed.

On the 20th at 5 p.m. Venus will be very near the crescent Moon, the distance between them being little more than the diameter of the latter. An hour later a still closer conjunction between Saturn and the Moon will occur in the N.W.

Also in broad daylight at 7 p.m. on the 20th Saturn will be occulted at places north of Brisbane.

On the 21st Venus and Saturn in Capricornus will appear to be less than half a degree apart; a week later the distance between them will be slightly more than 4 degrees, as on the 15th.

The Solstice will occur on the 22nd, when the Sun, having reached its extreme southern limit (23 degrees 27 minutes), will appear to stand still before turning northward.

Venus will reach the highest point in luminosity for this year and the next on 31st December.

Mercury rises at 3.47 a.m. on the 1st and at 3.40 a.m. on the 15th.

Venus sets at 10.3 p.m. on the 1st and at 9.52 p.m. on the 15th.

Mars sets at 8.51 p.m. on the 1st and at 8.39 p.m. on the 15th.

| | | | |
|---|---|---|---|
| 1 Jan. | ○ | Full Moon | 6 54 a.m. |
| 9 ,, | ☽ | Last Quarter | 7 36 a.m. |
| 15 ,, | ● | New Moon | 11 37 p.m. |
| 22 ,, | ☾ | First Quarter | 9 50 p.m. |
| 31 ,, | | Full Moon | 2 31 a.m. |

Perigee, 15th January, at 11.12 a.m.
Apogee, 28th January, at 5 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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